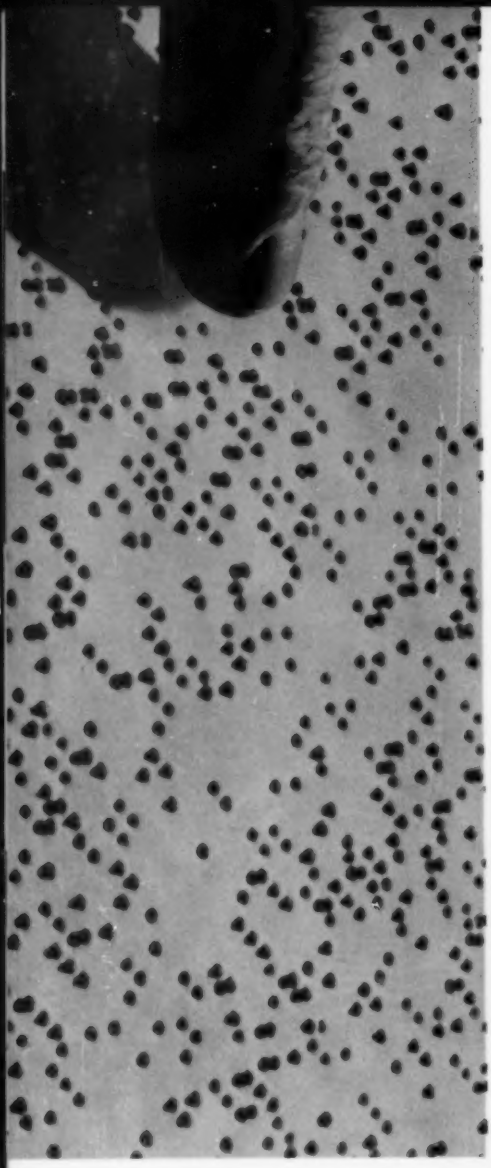

Bell Telephone MAGAZINE

SPRING 1960

IN THIS ISSUE

- New Pioneer Activities
- Braille Annual Report
- Marketing Programs
- World Communications
- Off-Duty Safety
- No. 5 Crossbar 'Package'

VOLUME XXXIX NUMBER ONE SPRING 1960

Bell Telephone MAGAZINE

A non-technical review, published quarterly to give Bell System management people a broader view of the history, objectives, operations, and achievements of this business than they might attain in the course of their day-to-day occupations, and an added sense of participation in the problems and accomplishments of our nation-wide public service.

COVER: The design by Art Editor Salvatore J. Taibbi incorporates pictures representing Pioneer activities (Braille), No. 5 Crossbar "package" (manufacturing scene), global communications (bow of cable ship), marketing (Princess), and off-duty safety (cartoon). In other words, it is a composite of many of the topics discussed in this issue.

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A MEDIUM OF SUGGESTION and A RECORD OF PROGRESS

GEORGE B. TURRELL, JR., *Editor* SALVATORE J. TAIBBI, *Art Editor*

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FREDERICK R. KAPPEL, *President* S. WHITNEY LANDON, *Secretary* L. CHESTER MAY, *Treasurer*

"Give some time to your fellow man. Even if it is a little thing,

do something for those who have need of help . . .

For remember, you don't live in a world all your own.

Your brothers are here, too."—Albert Schweitzer

A Tradition in The Making

Henry T. Killingsworth, *President,*

TELEPHONE PIONEERS OF AMERICA

THIS VERY MOMENT you are doing something which over a quarter of a million people in the United States and Canada cannot do. Your eyes, nerves, muscles, and brain are all carrying the image of and interpreting these black marks on white paper into words. You can see.

Betty Ann cannot. The pretty blue eyes she turns to the world give her no picture of that world. There are no sunsets for Betty Ann, nor the green exuberance of Spring. The faces of her parents, who lovingly share this burden of blindness, are "seen" with her fingers. Betty Ann is quite a young lady now, soon to graduate from high school. "When I do," she says, "my diploma should be inscribed with the name of the Telephone Pioneers of America as well as my own, for you deserve it as much as I." Many of her textbooks came from a Pioneer group which translated the printed word into the coded language of Braille.

Blindness is not the only form of isolation.

There is Mr. Johnson. Illness, loneliness and poverty have etched deep lines in his face. Before going to the farm, he was very active in church affairs. But the distance of a few miles between his new home and church might as well be a hundred. Until recently, that is. Now, every Sunday, a few ladies from the local telephone company stop by for those who want to attend church services. So, Mr. Johnson has begun to count time by Sundays.

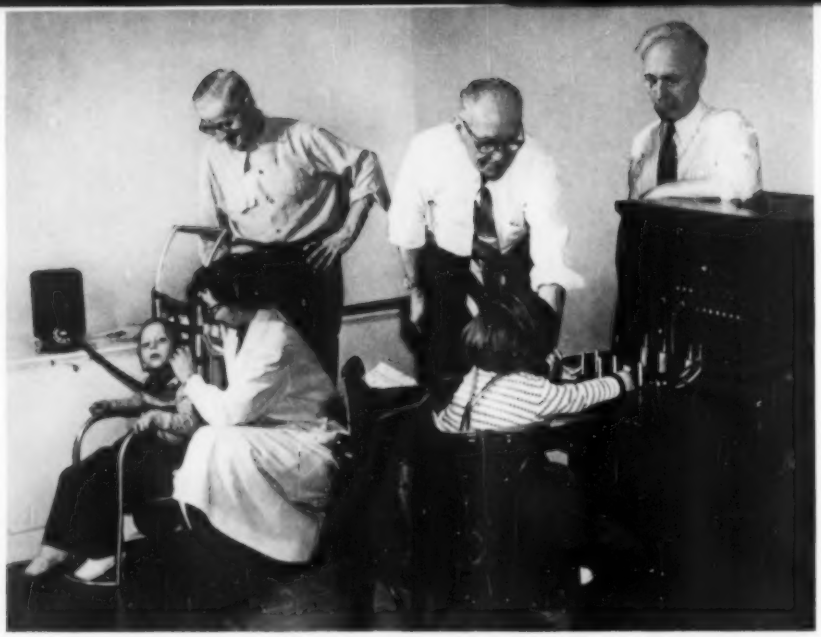
Then there is Helen.

Helen is five, but her coordination is poor, her speech faltering. This year, some men came to Helen's school and brought a new "toy." It was an old PBX, reconditioned with shiny plugs, new cords and a bright coat of paint. Through a slow and painstaking process, Helen was taught to play "operator." She has learned to grasp the cords more firmly, make connections without too much groping, and if she speaks slowly and carefully, you can understand her to say, "Hello, this is Helen. What number do you want?"

These stories and many like them are being played out in all parts of the country. Each distinct and individual, they nevertheless share a common theme — the active interest and work of Telephone Pioneers.

Universal Service

The Telephone Pioneers of America, a familiar name in our industry, is an association of long-service telephone people, and extends throughout the United States and Canada. Working in an atmosphere of service to others,



New "toy" *an old PBX that had been reconditioned was brought to this home for handicapped children by the Pioneers. It helps to improve speech and develop coordination.*

Pioneers live that spirit and, for many years, their names have been counted upon the rolls of many different civic and welfare organizations.

This interest on the part of individual members has recently been greatly expanded and incorporated as a group activity into the over-all Pioneer program. No longer the scattered efforts of a few but the concerted efforts of the many, Pioneers are rallying to meet the challenge of community service. They are at a new threshold.

Community needs are many and varied. Many times they are obvious, but not always. The first step in promoting group service is to seek out in each community the ways in which the particular skills, experience and interests of local Pioneers can be utilized to best advantage – to find and blend the need and the deed.

A 'Natural' for Pioneers

The community service idea never really enjoyed the doubting curiosity due a novelty. It found its niche in the Pioneer program with great ease because it is a "natural."

This is not to say it has been easy. By its very nature, it requires careful planning and a thorough understanding of what needs to be done and who can best do it.

But having undertaken a project, the Pioneer Association starts out with two distinct advantages.

First of all, it is not just a card-carrying organization. It is a member-participating organization. It exists and grows because its members initiate, support and take part in its activities.

Secondly, Pioneers by definition are pledged to the principles of Fellowship, Loyalty and Service. Now these principles are being extended outward – to the communities in which Pioneers live.

Before we join the Pioneers on a brief tour of their current service work,

it may be well to pause a moment and look back upon the road which has brought them to their new threshold.

When We Were Young

"It is difficult to realize today" — these words were spoken in 1913 before a Pioneer convention — "when we have standards that have been universally adopted, and the problems of practical telephony have been so largely solved, that at the beginning, in 1876, when the telephone was handed to us to put into the service of the public, there were no telephone men and there was no one who had anything more than a vague notion as to how the business could be started, or indeed the extent to which the public would use the telephone. The men who were drawn into the new field came from every line of commerce and the professions."

Technology and method, then, came with the doing and with exchanging ideas in the intense, informal evening meetings so common to that day. Everyone was the teacher and everyone was the pupil. One result of this learning together was the establishment of enduring personal friendships — friendships that were wrought upon the anvil of common experience and forged into permanence by the fire of a common goal.

From such beginnings came an industry — and the Telephone Pioneers of America.

The veteran telephone people wanted to continue their friendships outside the job and to find expression for their deep interest in telephone history. In recognition of these desires an association was formed which invited to membership all telephone employees having 21 years or more of service in the industry. That was in 1911, almost half a century ago.

The Growing Years

The association grew much like a house. It was erected as a simple structure, suitable for a small family. As the family grew, new rooms were added, and a new roof. But however it was expanded and streamlined, the basic timbers remain.

Today, the Telephone Pioneers of America is the largest society of its kind in the world. There are over 141,000 active members (those still employed in the industry) and 57,000 life members (those who have retired). A remarkable record of nearly 50 years' growth but pale in comparison to what the future holds. In the next 20 years, membership will soar to 400,000, doubling its present size.

The affairs of the association as a whole are governed by a president, senior vice president, 12 vice presidents who represent the geographic sections into which chapters are grouped, a secretary and a treasurer.

Legislative body of the association is the General Assembly which includes these officers, past association presidents, and chapter delegates. The assembly convenes once a year to review the past, discuss the present, and plan for the future.

Spanning the continent are 63 chapters and some 770 subordinate councils and clubs. Through their local activities, Pioneer philosophy comes to life.

Fellowship — Loyalty

Pioneering has many facets, one of these is fellowship. Picnics, parties, sports, tournaments and outings — all gather Pioneers, their families and a host of other telephone people together under the marquee of entertainment.

General Assembly *gives Pioneer leaders an opportunity to discuss the past and present and make plans for the future. Here, Mr. Kappel addresses assemblage at Cleveland.*

Fellowship finds expression in other ways — in cards, letters, visits in person or by phone, sharing in the joys of celebrations and holidays, and sharing, too, in the days of illness and bereavement. Last year, there were 600,000 of such fellowship contacts with active and life members. Statistics alone inadequately express the meaning of fellowship, but sometimes they reveal an inspiring story.

Hobbies are also prominent on the Pioneer agenda. They bring together people of like interests, foster the exploration of new, creative outlets, and promote a hobby-conscious approach to retirement.

Life members enjoy an honored status among Pioneers. There are over 200 life member clubs fully manned by officers and committees through which our retired comrades arrange their own social and fellowship affairs, issue publications, etc. Retirement does not diminish the interest of life members in their industry, and most chapters have a definite program for keeping them informed about the activities and progress of the telephone business.

The art and science of telephony is intricately woven into the fabric of the world today. It is indispensable to our pattern of living, from the small family group to international affairs. The pride in its tremendous importance rubs off on everyone who belongs to the telephone organization.

Loyalty has its origin in this feeling of pride. It develops further with experience, and with personal contributions to the progress of the industry, and thereby, becomes a part of our everyday way of life.

As long-service people, Pioneers personify this loyalty, and seek to express and strengthen it. One of the ways they

do this is by recognizing the efforts of people who have upheld and enriched the telephone creed. Another is by creating museums of old telephone equipment, photographs, records, and other memorabilia. They also commemorate important dates and places in telephone and Pioneer history. The chapters are now writing their own histories in preparation for the approaching fiftieth anniversary celebration of the association.

A Tradition Is Born

In reducing the story of Pioneering to capsule form, many important features have to be neglected. But at least one more idea must be interjected if the capsule is to contain all the basic ingredients. That idea is the fundamental one of a growing tradition.

Each generation of Pioneers adds its contribution to the inheritance received from those that went before. It is this ability to build upon tradition to create new traditions, which is Pioneering's greatest asset. This has brought the association to its present stature as a mature, well-ordered organization, with good communication between units, and with an acute awareness that future leadership demands present planning.

This is the foundation upon which Pioneers today may build. The current expansion of Pioneering to include community service is one more contribution – and an important one. To see it in the making, let us go to the grassroots of Pioneering – the chapters.

"How Do We Start?"

From Missouri, comes one answer to this question. The life member club in St. Louis, acting as a pilot group, formed a committee to help retired telephone people get into interesting and worthwhile volunteer projects. Letters were mailed to a dozen or so health, welfare and youth groups in the city, asking whether they needed volunteer help, and what training and time would be involved.

Responses formed the basis of an illustrated booklet, *As One Who Serves,* which was printed in cooperation with Southwestern Bell. Copies of the booklet were sent to each St. Louis life member. Armed with detailed information, the committee was able to help interested members find a suitable avocation. Committee, survey, interview, publicity – this was one way of organizing for service.

Sometimes a program is started from sources close at hand – members already engaged in community work – even from the affliction or disability of a particular member. Such personal motives entered one decision to undertake aid to the blind and to assist a multiple sclerosis club.

In general, the present work of the Pioneers can be grouped into six main categories – civic, health, education, youth, welfare, and church. Sometimes, the line between categories may be dim. It matters little by what name we call our work. It matters a great deal that we do it.

A life member club in Louisiana supplies volunteer clerical help in the Savings Bond Division of the United States Treasury Department.

Pioneer teams, from great metropolitan centers to country hamlets, annually join in community fund drives, helping to organize for collections, giving talks before civic groups, manning telephone centers, even supplying auditors to tally up the final count.

The Alexander Graham Bell Asso-

ciation for the Deaf receives help once a month from life members in Washington, D. C. Retired Pioneers fill in as clerical helpers; typing, filing and mailing literature.

South Carolina Pioneers will donate their eyes at death to the eye bank.

Pioneers in Connecticut, along with younger employees, are knitting a special type of bandage which is needed in the leper colony of Tanganyika, British East Africa. They have been on this project for two years now.

Pioneers *in Pennsylvania are organizing to take an active part in safety training.*

For the past nine years, a group of Pioneers in Massachusetts has been recording "talking books" for blind high school and college students. In 1958 alone, they made 6360 discs, representing 161 books. They also recorded an insurance manual for a West Coast man which helped him become an insurance adjuster.

Recently, a large company which records textbooks for the blind had an acute shortage of Braille labels and appealed to the Pioneer Braille group in New York for assistance. Result: ten Braillists completed 9,000 labels within a few months.

Unlike many other types of community work, becoming a Braillist means

Forerunner *of many similar Pioneer groups are these life members of Western Electric. For 12 years they have met regularly, prepared thousands of bandages for Red Cross.*

learning a new skill. It means becoming a student again, attending classes and doing homework. Braille transcriptions are primarily made for students and range from the first reader to advanced physics.

For young children, Pioneers illustrate Braille text with three dimensional objects, such as dolls, mittens and clothes pins.

Working for the blind is intriguing. A number of chapters have enlisted the participation of active and retired employees of Western Electric, Long Lines, Bell Laboratories, and several associated companies.

There is an annual Youth Jamboree in Asheville, North Carolina, where the young people of the state compete in a musical festival of song and dance. Pioneers in Asheville contributed a trophy which was awarded to an outstanding trio of songsters.

Wielding hammers, screw drivers and paint brushes, a group of Omaha life members keeps a Girl Scout camp in top-notch condition.

Some Florida members work with the Police Benevolent Association in planning programs for the playgrounds.

Pioneers in many cities play Santa Claus all year long by collecting and repairing toys, showing movies, and sewing garments for orphaned and hospitalized children.

Pioneers in Omaha make their lounge available to the "Voice Club" so that people who have had their larynges removed may have a convenient meeting room for speech classes.

For a number of years, the women of Wisconsin have helped serve Thanksgiving dinner to handicapped people.

A Pioneer group in Illinois transports crippled children to parties at their school. Chauffeurs turn chaperon as they stay to serve refreshments and distribute gifts.

One Sunday a month, Pioneer ladies in British Columbia don the blue uniforms of the Canadian Red Cross and work at the canteen which serves ambulatory patients of a military hospital.

In Utah, *books are collected to augment small library of a local public school.*

Puppets *are made by Pioneers for patients in children's hospital, San Francisco.*

Among the many requests for talking books have been those for religious subjects. For example, a six-disc recording of a prayer book is the latest achievement of Massachusetts Pioneers.

A small group of Pioneers in Illinois have banded together in a car pool. Each Sunday, they call for passengers at a home for the aged and drive them to church services in the nearby town. These folks range in age from 70 to 90 years.

These stories but sample the varied services which Pioneers are currently offering their communities. Sometimes the service involves only a few people; sometimes many. Sometimes the benefits of their work are felt in the immediate neighborhood; sometimes halfway around the globe.

Many members ***volunteer their services*** *for a wide variety of duties in hospitals.*

Signposts of Service

The symbols which accompany the stories above have been incorporated as part of the Pioneer program. They were highlighted at the 1959 General Assembly meeting in Cleveland. The meeting had a double theme — "Community Service" and "Self-Development" — which combine in a happy partnership.

Self-development, as generally discussed in Pioneer circles, relates to such diverse subjects as public speaking, literature, law for the layman, investments, and estate planning. It is in these and similar areas that Pioneers have established classes for their members and other interested employees.

But such a program carries a deeper implication than mere courses of study. It is an exercise in self-reliance, in an age where self-reliance has grown a bit flabby against the ravages of tension and insecurity. As a very minimum, these courses will provide channels for creative energy, through which telephone people can find greater assurance, self-confidence and new skills. These, in turn, will help the participants find personal enrichment and more satisfying expressions of their personalities.

One way in which the sense of inner security is demonstrated is by the acceptance of responsibility as citizens. That acceptance carries with it the mandate to act, usefully and constructively, for those less fortunate.

Such action can do no less than revive the quality of self-reliance in others. "You are bringing a deeper sense of security to my life than I thought anything could." This is from a letter Pioneers received for a community service rendered.

So the partnership of Community Service and Self-Development grows in mutual benefit. In serving ourselves, we become better able to unite in helping to serve others.

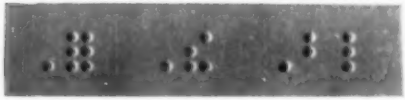
Each new tradition has been a challenge to the Pioneer spirit and has broadened the scope of Fellowship, Loyalty and Service.

With an ever-expanding program, Pioneers can better serve a rapidly increasing membership. Belonging to the Telephone Pioneers of America will become more meaningful and more rewarding to each of us as individuals. And our image of vitality and dignity will be enhanced in the communities we serve.

It is no wonder, then, that Pioneers can look to the future with hope and with pride.

Miss Chace *hears talking record.*

(Annual Report)



(for the Blind)

Pictured on these pages is another activity in which the Pioneers have a part —helping to make Braille copies or talking records of the A. T. & T. 1959 Annual Report available to blind shareholders. It was prepared in these forms as the result of a suggestion from Miss Louise Chace, a shareholder who has been blind for several years. It is probably the first annual report of any company to be offered in these forms.

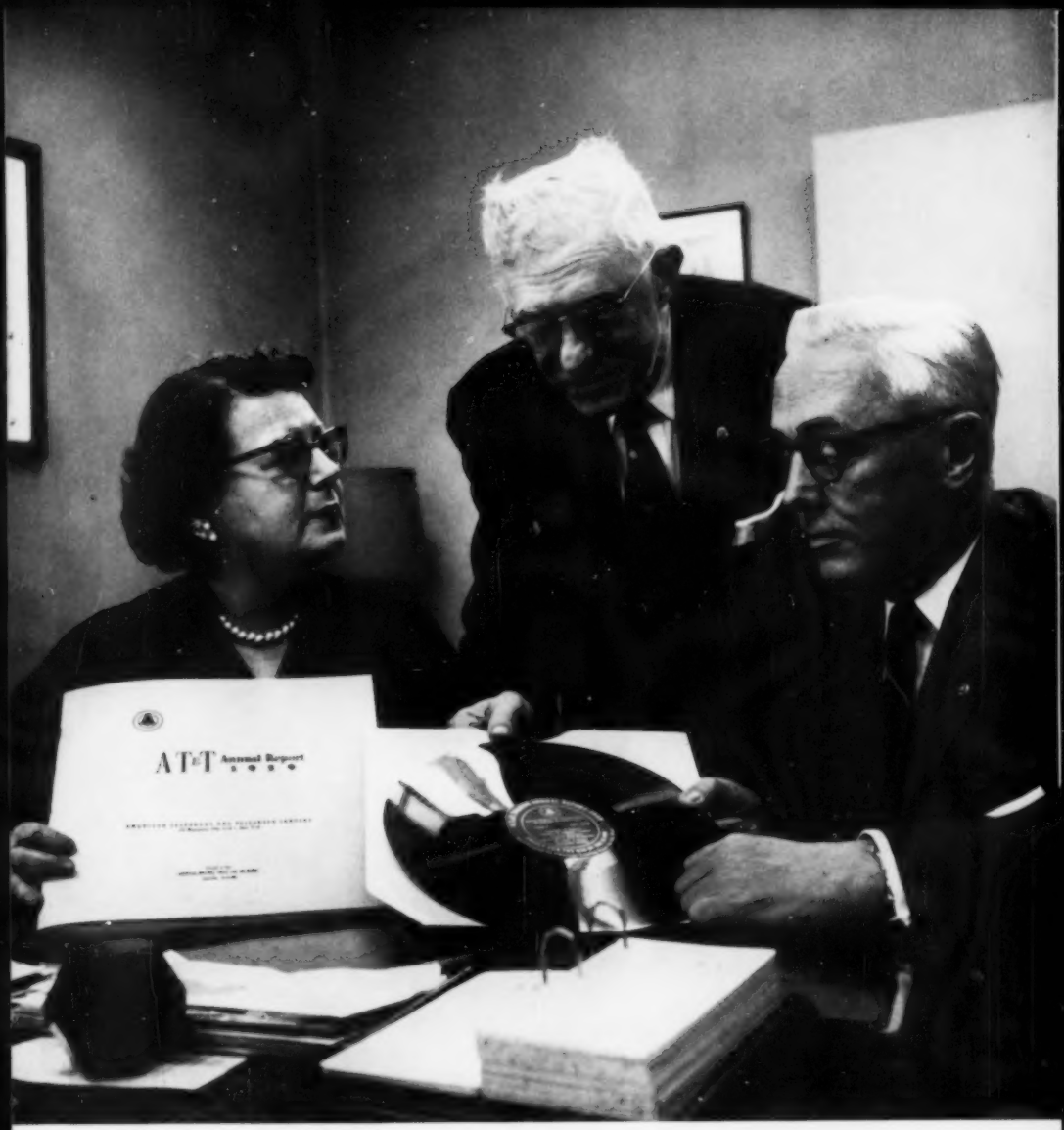
Braille *pages being prepared at American Printing House for Blind (left). Right, Mr. Kappel reads from Annual Report as talking record is made.*

Pages *from Annual Report in Braille. Chart (right, below) shows telephone growth in the U. S. Reproduction of page 3 of Report (far left) shows same chart in visual form.*

Printing *of Braille is shown above. Geraldine Grimes operates press, Marjorie S. Hooper of American Printing House for the Blind and C. E. Sims of Telephone Pioneers watch.*

Final step *being performed by Elizabeth Burkhart (below) is the stapling of the covers to the folded pages of the Brailled Annual Report.*

Talking record *of annual report is pressed at American Printing House for the Blind by Mrs. Mary Adams.*



Braille Annual Report *and talking record are shown above by Marjorie S. Hooper, Braille and large type editor, American Printing House for the Blind; C. E. Sims, president of the Life Member Club, Louisville Council, Telephone Pioneers; C. H. Green, vice president and general manager Kentucky operations, of the Southern Bell Company.*

PRESENTING
The Princess phone
IT'S LITTLE, IT'S LOVELY, IT LIGHTS!
The Princess phone
BUSINESS OFFICE
ANNOUNCING
HOW TO
put Princess promotion material to work for you
The Princess phone
DEPARTMENTAL INFORMATION LETTERS
The Princess phone
SAMPLE PROMOTION PIECES FOR
The Princess phone
PLANT is PROUD to sell The Princess PHONE
MARKETING PROGRAM
FOR THE NEW
Princess
phone

The Princess is more than a telephone; it is also a symbol of the coordinated team effort being used to help sell our products in today's competitive markets

Marketing Programs Pay Off!

Roy E. Alberts and Dan E. Hutchins, *Marketing Department*

AMERICAN TELEPHONE & TELEGRAPH COMPANY

AN EXCITING and significant trend is under way in our industry. Not only are we giving more attention to the development of new products and new services than ever before but we are developing dramatic techniques for introducing them to the public.

This is a response, of course, to the new, competitive aspect of our business. Our markets today extend far beyond the traditional residence and business basic service. Many of our new products are optional services designed to raise our customers' "communications standard of living."

Examples *of the items to be found in a marketing program kit are seen at left.*

Now we are also concerned with the special communications needs of such groups as farmers, big business, small business, railroads, airlines and many other special categories of customers.

These new products put us in quite a different competitive category than we have been in the past. We must compete on the open market for a share of the customer's dollar. With some items we are in direct competition with the products and services of other industries.

To meet this competition we must be imaginative, skillful and aggressive in introducing our products.

In response to this challenge, we are "wrapping" our new products in marketing programs. What is a mar-

keting program? First, it takes the physical form of a thick folder which is the culmination of a big coordination job — but more important it is the concrete result of the best thinking of all interested groups in operations, research, engineering, public relations, manufacturing, marketing, and higher management focused on a single product or service. It contains the tools to sell, install, maintain, promote and administer the activities surrounding the new product. We hope that centralized preparation of such programs will reduce preparation costs while maintaining quality — especially in promotional pieces which are offered for sale to the Operating Companies. We feel that a comprehensive marketing program is the best vehicle to generate enthusiasm and knowledge and permit product introduction with a minimum of local staff work and maximum impact on customers.

"The Package"

The marketing program is presented through a personal visit to each Operating Company. A set of slides covers product background, trial results, and the marketing plan. The marketing folder includes: a visual sales aid, radio-TV advertising ideas, customer instruction brochure, general promotion ideas, samples of miscellaneous promotional items, sales training material, profitability studies, cost and rate information, all departmental and technical letters on the product, sample talks, press releases, employee information article and leader's guide. The leader's guide with a set of slides enables each company to duplicate the entire presentation later for others in

"Princess" *is holding The Princess. A.T.&T. coordinating team visited Associated Companies to present marketing program. Each company chose a "princess" to model phone.*

the company. Naturally, because of the difference in products and their market, the exact contents of each marketing program varies.

There has been a number of such programs during the past two years. Since the Call Director and 6-A programs in the fall of 1958 there have been similar programs for public telephones, Bellboy personal signaling service and the Automatic Call Distributor. And now The Princess phone! The Princess is not only the latest but the best example of the new, hard-hitting techniques that have been developed for guiding our new products into the market. To us, in Marketing, The Princess is more than a telephone, more than one of our newest and most popular products. It is a promotion, a campaign, an example of a revolutionary new selling concept for the Bell System. It is a spark to sales enthusiasm; a sign and product of the times.

Perhaps the best way to appreciate the significance of the marketing program concept is to take a close look at The Princess as it was developed, introduced and taken to the System.

First, The Idea

The Princess phone was not born overnight. Since 1956 The Princess has passed through a vigorous, conclusive and triumphant series of product and market trials. Its story includes many research, development and marketing dollars and it all started with an idea or a group of ideas: providing customers with a wider choice of telephones; increasing extension sales; increasing profits; cultivating a progressive image in our customers' minds.

From these ideas has come the most

Display setting *above helped coordinating team put across The Princess story with Operating Company audiences. Sound effects, tape recordings, slides, movies added punch.*

Coordinating team *consisted of Don Marshall, Dick Chichester, Owen Sullivan, Dan Hutchins and alternates George Callahan and Gene Lape. The team traveled 50,000 miles.*

thoroughly market tested and the most thoroughly researched product in telephone history. All along the way, advice of customers was not only solicited but heeded. Eight Operating Companies participated in one or more phases of research dealing with: pilot design, features, proper rate plan, color and name preference, promotional techniques, and an actual all-out sales trial.

While the early market trials assured us that The Princess would sell — and that people were willing to pay a premium for it — they could not be of sufficient scope to tell us what the real market potential would be on a System-wide basis. For this reason, it was decided to introduce The Princess in four reconnaissance areas instead of going System-wide in one bite.

By using the area approach it was possible to determine — early in the game — the magnitude of sales and the effect of these sales on our existing line of products. By doing so, Western Electric can adjust and gear production to the appropriate level. In addition, the marketing program could be appraised. Various advertising media could be evaluated to provide guidance on how much should be spent and in what directions — to promote The Princess effectively. Primarily, however, the area approach gave assurance that other Bell Companies can be added to the initial sales network knowing full well that there will be adequate telephones to satisfy sales. This coordination is very important. High inventories tie up capital unnecessarily and shortages deprive us of revenue, irritate customers and take the "wind" out of promotional and employee efforts.

The Introduction

Now, let's look at The Princess' introduction. The reconnaissance areas in which it made its debut were: the states of Colorado and Georgia, the greater part of the Illinois State Area and the Central Area of Pennsylvania. Sales started on September 14, 1959. The rate treatment employed by each company was similar. An extensive research plan involving interviews and information compiled from each order was used to give specific product marketing data. We were very interested in:

- how many were being sold and by whom?
- on what kind of orders were Princesses being installed?
- what color distribution was being installed?
- what kind of customers buy?

- how many were replacements — what were they replacing?
- what portion of inward movement were Princesses?
- where do customers install The Princess?

Our three main sales channels were used: selling through the business office, selling through Plant installers and repairmen, selling through the business market sales force and, as an added starter, through non-customer contact employees, such as Accounting clerks and Traffic operators.

A Promotional Program

A carefully conceived promotional program was utilized. This promotion featured tested appeals, tested newspaper advertising, tested TV and radio commercials and exciting, sales-producing publicity and point-of-purchase display material. From earlier customer-appeal tests the selling message came together in one catchy slogan: "It's Little, It's Lovely, It Lights." All in all, included in the initial promotional package were over 30 different items ranging from personal and TV appearances of Miss America of 1958 to bill inserts.

Excitement came fast during the four-area introduction of the Princess.

Audiences *such as the one above greeted the team of speakers during their tour. They told the story of The Princess telephone to over 3500 key people in all the Companies.*

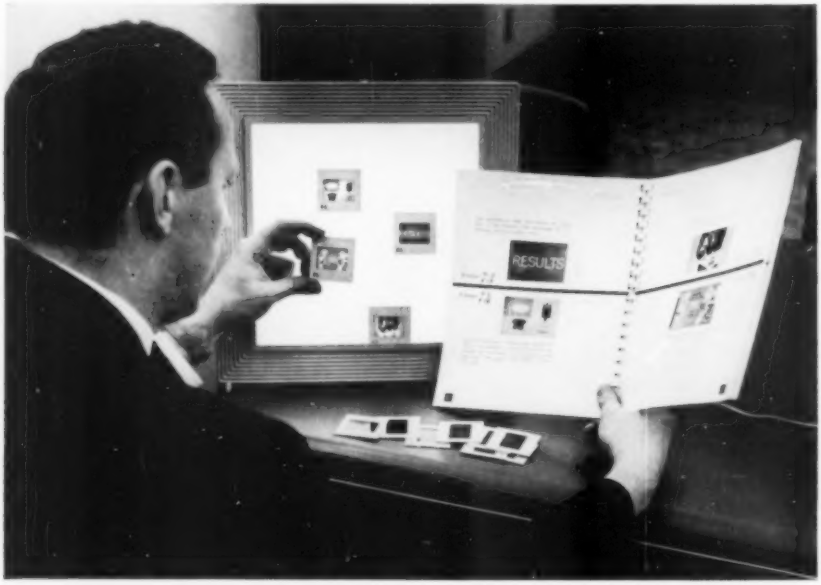
The enthusiasm was infectious – and it brought results and answers.

The knowledge gained during the introduction was assembled, organized and used to complete a marketing program with specific recommendations and help in each important step of marketing The Princess. Sales have gone so well that Western Electric has almost doubled production – but even at higher production levels selling of The Princess in all companies will not be accomplished until later in the year.

During February and through April, The Princess program was taken to each Operating Company. Presentation at that time allowed each company plenty of time to "gear up" for its Princess introduction. As the picture on page 19 indicates, the display was attractively staged as A. T. & T. Princess coordinators representing Marketing, Business Office, Plant and Public Relations made the presentation. The meetings lasted half a day and included time for a long question-and-answer period. Interest was tremendous as representatives from all segments and all levels of each company got The Princess story first-hand. A local girl dressed as a "Princess" took part in the presentation and added greatly to the impact of the program. All areas of the marketing plan were discussed and each of the promotional pieces shown.

Company coordinators are busy now putting the marketing plan into effect. The Princess has turned out to be a real money-maker. In fact, it represents a selling opportunity without parallel in the history of the Bell System.

We hope to follow up The Princess success with programs later this year on the Bell Chime, Home Interphone, Farm Interphone, Data-Phone, Prewiring, and the Universal P.B.X.



"Do it yourself" *kits containing slides and leaders' guides were made available so that the Operating Companies could carry the marketing program to all of their employees.*

The world urgently needs a communications network that is truly global in scope. The problems thus posed, and their possible solutions, challenge the scientist and stagger the imagination of the layman

Progress and Problems in World Communication*

Estill I. Green, *Executive Vice President*
BELL TELEPHONE LABORATORIES

TODAY, WHEN WORLD affairs seem at sixes and sevens and we wonder what this world is coming to, world communication is likewise at a critical stage. Change is accelerating; in fact, world communication is entering a new, dynamic, indeed explosive, phase. This change, however, will not of itself bring integrated and effective world communication. Planning is necessary. And there is little use planning after things have happened.

For a number of years the International Telecommunications Union (UIT) and its organs, the International Consultative Committees (CCIs), have done a great deal toward achieving international cooperation and coordination with respect to telecommunication facilities and services. But in large measure these activities have been directed toward augmenting the effectiveness of regional communication in different parts of the world. Emphasis needs now to be centered on true world communication, i.e., communication across oceans and between continents. It is proposed, therefore, that we address ourselves to the matter of what changes

*This is an abridgement of an article which will appear in full in early issues of the *UIT Journal* and *Electronics* magazine.

are occurring in world communication, what new techniques are involved, and what problems lie ahead.

The Importance of Telephony

Of the various forms of telecommunication, telephony far exceeds all the rest both in volume and importance. Telephony, then, is where we start. Its growth has been one of the real marvels of the 20th Century. Vast continental networks, complex and fairly well integrated, with myriad interdependent parts, have been built up in Europe and North America, together with smaller but nevertheless substantial developments in other parts of the world.

Evidence of what has happened is found in the number of world telephones (Fig. 1). Notwithstanding the tremendous surge in world population, the number of telephones has grown three times as fast. Since 1935 this number has multiplied nearly fourfold, today's total being about 135 million. Automatic switching has grown even more rapidly than the number of telephones and now embraces about 85 per cent of the total.

Even more striking has been the growth in the number of telephone conversations. However, when it comes to intercontinental telephone calls, statistics are hard to come by. In default of other figures, suppose we look at transoceanic telephone messages terminating in the United States mainland (Fig. 2). We used to refer to these as "overseas" messages, but now so many of them go underseas that we have had to find a new name. By almost any standard of comparison, the number of such transoceanic messages is small in the extreme. The rate of growth, however, is rather startling: now about 15 per cent a year. Evidently transoceanic telephony is beginning to mushroom. But this is not the whole story, as we shall see.

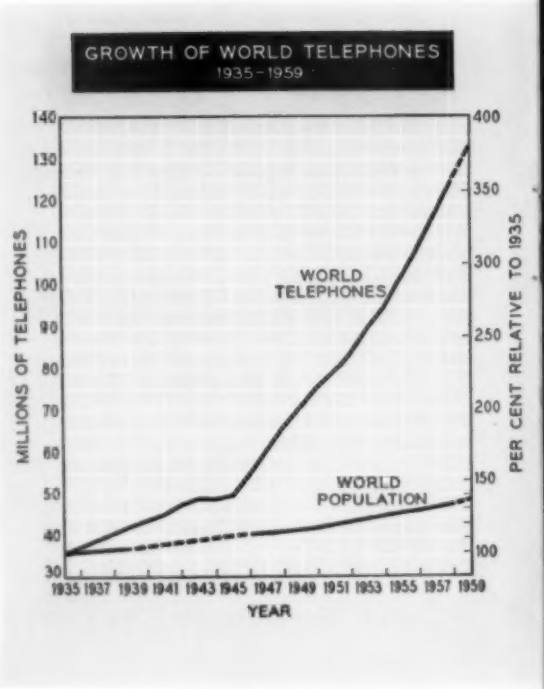


FIG. 1.

The surge in overseas telephony is not at all surprising when we recall the history of transoceanic communication. Less than a hundred years ago all communication across the ocean was by letter or personal messenger, using sailing ships. The first transatlantic telegraph cable was laid in 1858, but promptly failed. The next cable, in 1866, provided the first semblance of high-speed communication, for telegraphic material only. Not until 1927, when the first commercial radio telephone circuit was established between England and the U. S., could the public talk to one another

across the Atlantic. Even then the transmission performance of the radio circuits was subject to nature's vicissitudes and left much to be desired.

It was nearly three decades later when, after years of development and experimentation, the first repeatered submarine telephone cable system was placed in service across the Atlantic in 1956. Then for the first time there became available reasonably adequate numbers of transatlantic telephone circuits with transmission properties equaling or exceeding those of the best land line circuits. The effect upon usage was immediate and spectacular. In fact, traffic to England practically doubled in one year. At the same time, finding it so much easier to talk, people talked longer.

Thus it became quite clear that transoceanic telephony had up to that time been limited, not by basic demand, but by available technology and facilities. So the rush was on. Other ocean cables with submerged repeaters followed in rapid succession, with still others now in the planning stage. So at last transoceanic communication began to realize its manifest destiny.

Thus far the bulk of the service between continents has been for telephone and telegraph purposes. In addition, sporadic use has been made of facsimile, picture transmission and sound broadcasting. More recently, there has been limited use of higher-speed data transmission. And greatly slowed-down television has been employed for recording and subsequent broadcasting.

In the future we may expect greatly increased demands for these types of services and others as well. Governmental needs, already substantial, are growing apace, and introduce special

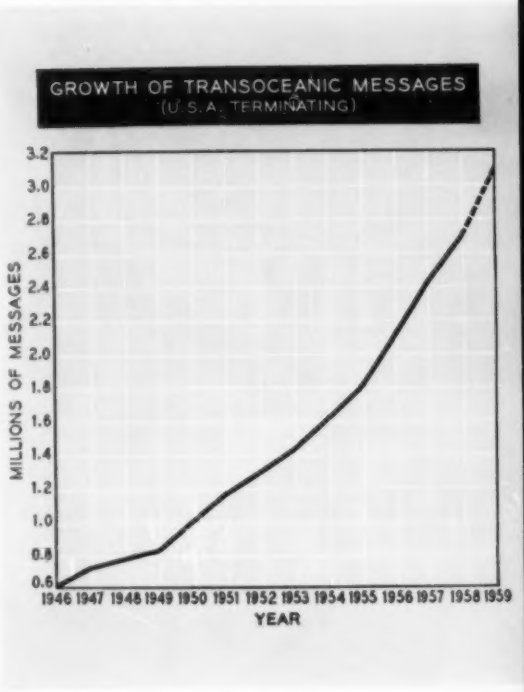


FIG. 2.

requirements stemming from the need for recording, encryption and visual information. Increased demands for data service are clearly to be expected. Live television for entertainment, news etc., is a distinct possibility.

Transoceanic Cables

It is tempting at this point to plunge immediately into the maelstrom of problems involved in true world-wide communication. However, let us instead approach these problems by way of various types of transmission media, systems and techniques that bear on the matter. The most logical starting point seems to be submarine cable systems.

Transoceanic cable systems of the

TASI *bays being installed at the White Plains, N. Y., transatlantic cable terminal.*

type introduced in 1956, with submerged electron tube repeaters, provide a bandwidth of about 144 kc. This, with one cable for each direction, affords 36 high-grade carrier circuits having a gross bandwidth of 4 kc per channel. But the cost of these circuits is so high, and the traffic demands so great, that two things are being done at the terminals to obtain greater efficiency of use. The first of these consists in the provision of new channelizing equipment employing 3 rather than 4 kc spacing per channel. This increases the number of talking circuits from 36 to 48. Through an ingenious frequency plan devised by British Post Office engineers, the speech impairment due to the closer spacing is considerably reduced.

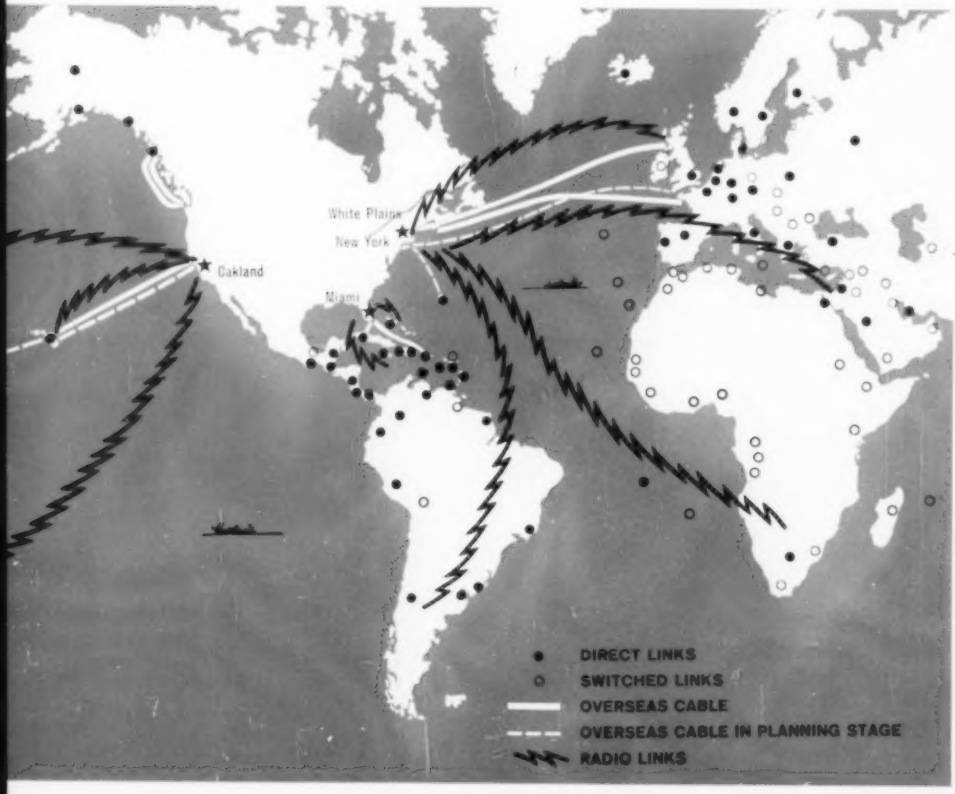
The other forthcoming scheme at the cable terminals embodies an intricate and precise process for the vivisection of speech. This system is known as TASI, an acronym for "Time Assignment Speech Interpolation." It takes advantage of the silent intervals present in each half of a two-way conversation. By the use of high-speed switching to interleave the voice spurts of different conversations, the carrying capacity of the cable for telephone conversations is doubled. For a complete terminal this requires some 16,000 transistors, but it pays off handsomely. In general, this method is not applicable to services other than telephony.

Close on the heels of these terminal modifications will follow more efficient cable systems. Already, shallow water cables of British design carry 60 4 kc two-way channels in a single cable between Newfoundland and Nova Scotia. A cable of this type, suit-

able for deep-water laying, with 80 3 kc channels is to be placed between Newfoundland and Scotland in 1961. Another single-cable design, suitable for 100 two-way 4 kc channels, or 128 two-way 3 kc channels is planned for service in 1963, to be followed by a similar cable across the Pacific in 1964-5. And we may in due course expect to have cable systems, using either transistor or vacuum tube repeaters, which will afford a substantially wider transmission band, with resultant economy and also increased adaptability to services other than telephony.

Radio — Ionospheric Reflection

Despite the rapid extension of transoceanic cables with their great transmission advantage, high frequency radio links using reflection from the ionosphere, in the range from about 5 to 30 mc, will continue to be a substantial part of the world communication network for years to come. The service performance of the high-frequency radio-telephone facilities is being improved by increasing use of single sideband techniques, higher power output, and wide-spaced diversity reception. Unfortunately, con-



gestion in the high frequency radio spectrum is so great that in the immediate future it will be difficult, if not impossible, to find all the assignments needed.

Over-the-Horizon Radio

One of the interesting developments of recent years has been that of radio systems that make use of scattering in the troposphere to transmit wide frequency bands. Such systems, with relay stations up to 200 miles or more apart, are capable of use either for a number of telephone channels or for television. These systems afford not only wider bands but more reliable transmission than the high-frequency ionospheric-reflection radio and they promise to have continuing value, especially for island communication.

Satellite Communications

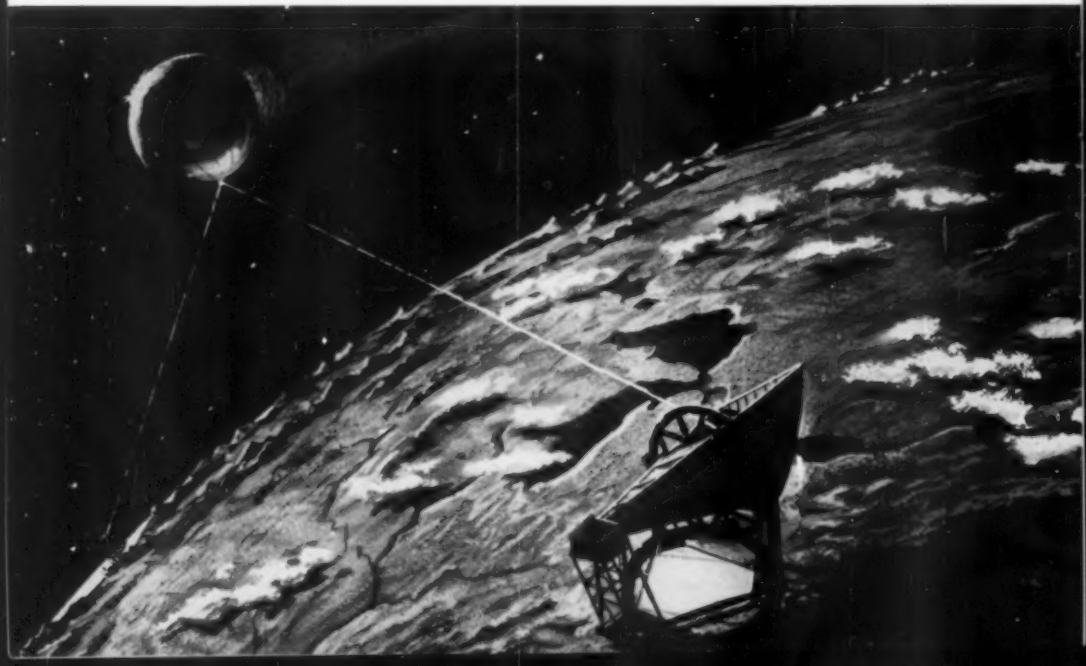
As discussed by Dr. John R. Pierce in his article "Communication Satellites" in the Winter 1959-60 issue of this magazine, space technology offers another contribution to the transoceanic scene, namely, radio communication via satellites. As Dr. Pierce points out, the attractiveness of satellite communication systems lies in the possibility of obtaining wide transmission bands suitable either for handling television if desired or for larger volumes of narrower band traffic, including military needs.

The experiments which are now under way on communicating by means of reflecting satellites will shed some light on the feasibility of satellite communication systems; in any event, their success will depend on the most advanced art that research has to offer. There will be many complex technical problems still to be tackled and the place of satellite systems in world communications remains to be seen.

Pulse Transmission

Apart from these techniques for effecting communication across the oceans, the art is overflowing with

Radio *communication via satellites holds great promise for global communications. The illustration below is artist's concept of a signal being reflected to reach a distant point.*



new techniques and devices which bid fair to revolutionize intracontinental communication and in turn react importantly on world communication. To shun the encyclopedic, let us merely note a few examples.

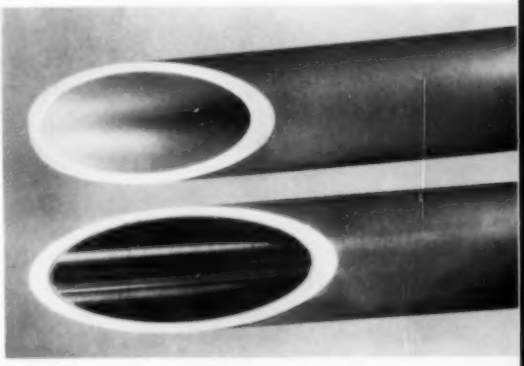
New transmission systems which use rapid electrical pulses instead of the smoothly varying signals now sent over transmission lines offer great promise. In these, speech and other signals will be carried by pulse methods, with channels interleaved in time instead of frequency. Indeed pulses may well become the heartbeats of the new communications era.

In general, the most promising of pulse modulation methods is PCM (short for pulse code modulation), in which successive samples of the signal wave are transmitted by an extremely high speed pulse code. The pulse code method provides, at the expense of bandwidth, low vulnerability to interference. The pulse signals can be regenerated at each repeater, so that accumulative distortion can be kept small. Thus the time-honored problems of noise and crosstalk may be exchanged for new ones centering in synchronization and delay correction.

Waveguide System

One likely application of pulse code modulation will be in a waveguide transmission system being developed in the U. S. to provide greatly increased information-carrying capacity on major overland communication routes when needed in the future. The transmission medium will be a hollow, dielectric-lined copper pipe or a helix, about two inches in diameter, acting as a guide for radio waves traveling inside. The waveguide system will use a specially oriented electrical wave which is unique in that it does not grow weaker with higher frequencies.

The frequency band transmitted inside the waveguide may be nearly four times as wide as the entire band



Wave guides *may provide greatly increased capacity on future overland routes.*

now used for radio communication. The same band can be used, for either direction, inside adjacent pipes. The waveguide will therefore yield a vast frequency spectrum not vulnerable to fading, atmospheric effects, interference or other troubles that beset the radio, and not subject to public demands for frequencies and consequent governmental restrictions. Within this frequency band, a large number of broadband channels, each carrying perhaps a hundred million bits of information per second, will provide a handling capacity for perhaps as many as 200,000 voice circuits or 200 TV pictures.

Electronic Switching

Switching is just beginning to feel the full impact of the new electronic art. All of the automatic switching systems up to now have been built around the electromagnetic relay and other electromechanical devices. Such

devices are, in modern terms, quite slow; they require some thousandths of a second to operate. In contrast, electronic devices such as the transistor will perform switching or complex logical operations in a few microseconds.

New switching systems under development will profit from this high speed through centralizing of functions and time-sharing of the computer and control apparatus. In contrast to an electromechanical switching office, where all instructions had to be wired into the equipment, the electronic office will afford a high degree of versatility through programs stored in the memory facilities of data systems. Such features as simplified codes for reaching frequently-called telephones wherever located, automatic subsequent completion of "line busy" calls, automatic transfer of incoming calls to any specified telephone, automatic centralized answering service, and the like should become commonplace. These electronic switching systems should in due course benefit world communication, both through faster interconnection and through greater flexibility for handling complex translations and other difficult switching problems.

New Problems — The Length Factor

We can see in the offing a veritable legion of such new techniques and devices. But it is now time to consider how the waxing demands for world communication and the burgeoning constituent techniques will affect overall planning and performance requirements. Any attempt herein to specify precise requirements would indeed be foolhardy. Suffice it then, to set forth certain general observations, leaving the exact specifications as an exercise for those who are skilled in the art.

Perhaps the simplest place to start is with the critical factor of maximum length. In North America it has thus far been generally accepted that the maximum length for any type of intracontinental circuit might be assumed not to exceed about 4,000 miles. In Europe, something like 1,500 miles has been a corresponding guide for international circuits. For world communication, a new look is needed. Despite the present importance of economic factors, it would seem prudent to plan for a future maximum length of at least 10,000 miles, perhaps more.

The inevitable increase in length will influence all other requirements. Increased distance means increased transmission time. At least it is fortunate that high speed carrier transmission over cable or radio can provide the circuits which will form the backbone of the world-wide network. Increased distance also means, in all probability, more switches and more carrier-to-voice translations. For these and other reasons, increased length will intensify, sometimes in major degree, the transmission problems such as distortion, noise, delay, echo and crosstalk that we have coped with for many years.

Furthermore, in this exacting tomorrow present maintenance methods will become inadequate. Reliability will be increasingly important and must be freed from the tyranny of increasing numbers of components and devices. Automatic measuring devices will be required for constant monitoring of transmission performance, and automatic means for correcting the inevitable changes so as to assure adequate end-to-end transmission. Automatic means for sectionalizing trouble

and quickly restoring service will also be needed.

End Links

It is natural, in discussing world-wide communication, to center attention on long international circuits. It would be a mistake, however, to overlook the part played by the terminal links and especially the customer's telephone set and the communications loop connecting him with the central office. The telephone set itself is an important factor in some types of distortion and is the main cause of echo and transmission loss problems. The customer's loop is often the principal source of noise. Transistors may afford a new freedom in telephone set design that will ultimately help solve many problems. In any case, the neglected end link offers challenging opportunities for improvement in world telephone communication.

World-Wide Automatic Switching

Over most of the world enormous strides are being made in the automatic switching of national and international long distance calls, under the control of dialing, by either operators or customers. These developments clearly presage the advent of automatic switching of intercontinental calls. However, many difficult problems remain to be solved in the continental networks, and even more knotty ones for the global case.

Some of the global switching problems are primarily technical; others involve both technical and nontechnical considerations. An important technical problem is the lack of a standard dial. Difficulties are fairly obvious. In the U. S., for example, the letter "O" corresponds to the numeral six; in the U. K. to the numeral zero. Hence operators or equipment must do a translation on office codes using the letter "O." Differences in alphabets, as for instance in the Danish dial, suggest that it will be necessary to go to all-numeral codes before customers can dial intercontinental calls [See "New Numbers For Tomorrow's Telephones" *B.T.M.*, Winter 1959-60–*Ed.*]. Even then the Swedish dial will present a problem because its numerals run from zero to nine instead of the more usual one to zero. Too, there are other difficulties, both technical and economic, involved in customer dialing of intercontinental calls.

Global automatic switching will in due course encounter a situation of serious proportions arising from the lack of a world-wide numbering plan. Existing continental numbering plans are running out of capacity. Apart from capacity, a world plan will have to provide for calling several types of operators, preferably on a universal basis, for test and maintenance calling and for other special needs. There will be questions of whether a fixed or variable number of digits should be used, and what the maximum digit capacity should be. Compatibility between pushbutton sets and dials will also need to be considered.

Signaling Problems

World-wide automatic switching involves still other problems having to do with signaling arrangements, i.e., the means whereby supervisory and control information is made available at both ends of a connection, as well as at intermediate switching points. At present the electrical language used to transmit such signaling information differs between countries, and even within countries. In the past, progress

has been made in Europe and North America on the standardization of signaling arrangements which are, unfortunately, dissimilar for the two continents. Now, with dialing over the transatlantic cables imminent, coordination between the continents has become essential.

Data Communication

In view of multiplying demands for various forms of data communication, and the growing need for compatibility between transmission links and terminal gear, coordination in this field on a world-wide basis will assume increasing importance. Much of the data will be at low speed, corresponding to the rate of human generation and utilization. Higher speeds will be needed, however, for more efficient use of communication channels, as well as for direct machine-to-machine conversation. Although non-switched point-to-point data links will continue to be used, it seems highly probable that the world's telephone network will be employed more and more for handling data [See "DataPhone offers Improved Communications for Data Processing" *B.T.M.* Autumn 1959—Ed.]. For this purpose the transmission performance of the circuits will need to be improved.

International consideration should soon be given to the standardization of an adequate and economical set of bandwidths for data transmission, together with switching arrangements for selecting interoffice trunks of the required bandwidth for each connection. Standardization of data rates will also be desirable, and agreement on performance objectives for transmission links, especially for those factors, such as impulse noise and delay distortion, which affect data signals more seriously than speech.

Important advantages would also result from the standardization of codes. Lack of such standardization has already given rise to difficulty in the interconnection of the European Telex network and the Bell System TWX network. Because these two systems use different codes (although of the same type) and also different transmission speeds, translation and storage must be provided at the interconnection points.

Related to the matter of codes is the subject of accuracy in data transmission. Although almost all telegraph communication is now carried on without special means for error correction, there is evidence that, in the future, error correction either by detection and partial retransmission or by means of self-correcting codes will be needed for many applications of data transmission.

Standardized signaling and supervisory arrangements will likewise be desirable for a world-wide data system. The concept of a common switching network suggests the need for a common language to enable stations to talk to switching centers and switching centers to talk to one another.

Television

Television across the ocean is bound to come, although the extent to which economic justification will be found is still somewhat problematical. Problems of language differences and time differences will be worked out somehow. World-wide standardization of television signals, while desirable, seems quite impracticable; conversion from one kind of signal to another will take care of the situation. For the present, bandwidth across the ocean is a serious problem. However, im-

proved transoceanic media will be available in a few years. Band compression techniques of one kind or another can, if necessary, be used at a sacrifice of quality.

Military Communications

Because of the need for far-flung control of military organizations and operations, global communication for military purposes is today assuming special importance. Such communication requires all sorts of interlinkages and involves all kinds of signals—aural, visual, pictorial, telegraphic, high speed digital, and so forth, with stringent requirements on speed, reliability and security.

In some measure these needs will be met by means of special military networks. However, interrelations with the commercial facilities are inevitable, and these will be greatly facilitated by advance coordination and standardization.

Conclusion

Here we must conclude. If it has been made to appear that the future path of world communication lies through thorns as well as roses, this has not been accidental. We must not, we dare not, ignore the difficulties. Rather should we be mindful of Samuel Johnson's dictum that "life affords no higher pleasure than that of surmounting difficulties."

If emphasis has been placed upon the need for a high level of international cooperation and standardization in solving the problems of world communication, this has been based on deep conviction. And based, too, upon a strong sense, indeed a vision, of the vital role that the UIT and the CCI's can and must play in this cooperative effort.

If urgency has been stressed, this merely reflects an uneasy feeling that we may be dancing on top of a technical volcano.

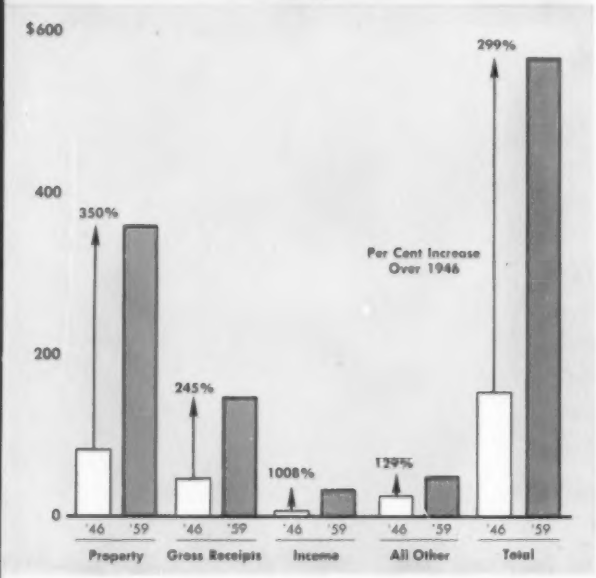
Finally, it may be appropriate to suggest the existence of a basic relationship between world communication and world peace. The relationship may be merely this: that honest communication begets understanding, and that understanding is a necessary though not sufficient condition for harmonious life.

State and local taxes are becoming an increasingly serious factor. They are an important reason why—

The Tax Slice is Getting Bigger!

"Federal, state and local taxes on operations were $1,690,289,000, equal to $7.66 per share of A. T. & T. stock, or considerably more than the earnings per share of $5.22," President Frederick R. Kappel pointed out in the A. T. & T. 1959 Annual Report. The charts on these pages show the growing impact of state and local taxes paid by the Bell Companies on the over-all tax bill. These taxes are levied under more than 80 different titles by over 100,000 different taxing units on a System-wide basis—each unit levying taxes as it sees fit.

BELL SYSTEM STATE AND LOCAL TAXES BY TYPE
1946-1959

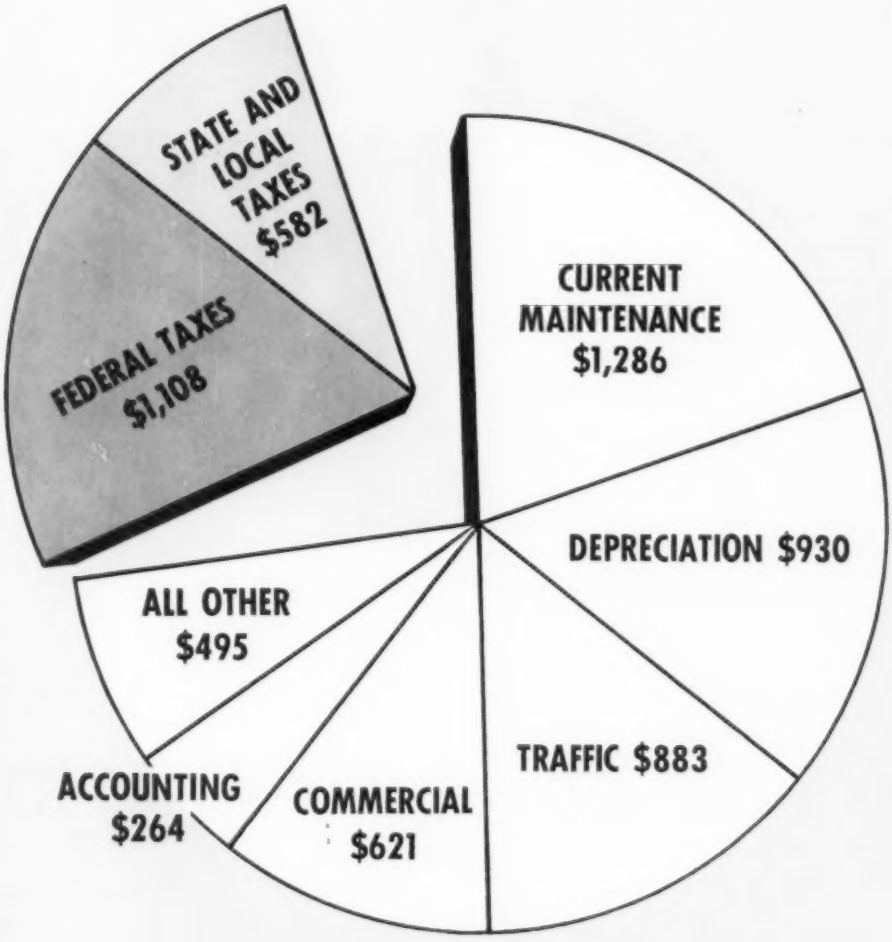


BELL SYSTEM

TOTAL OPERATING EXPENSES AND TAXES

YEAR 1959

(in millions)



State and local section of the tax slice is getting larger each year and is approaching the size of the federal section which, though heavy, has remained fairly constant in recent years. In addition to the tax slice above, telephone users paid some $600,000,000 in Federal excise taxes and $34,000,000 in state and local sales taxes on telephone service.

Preview of 'The Package'

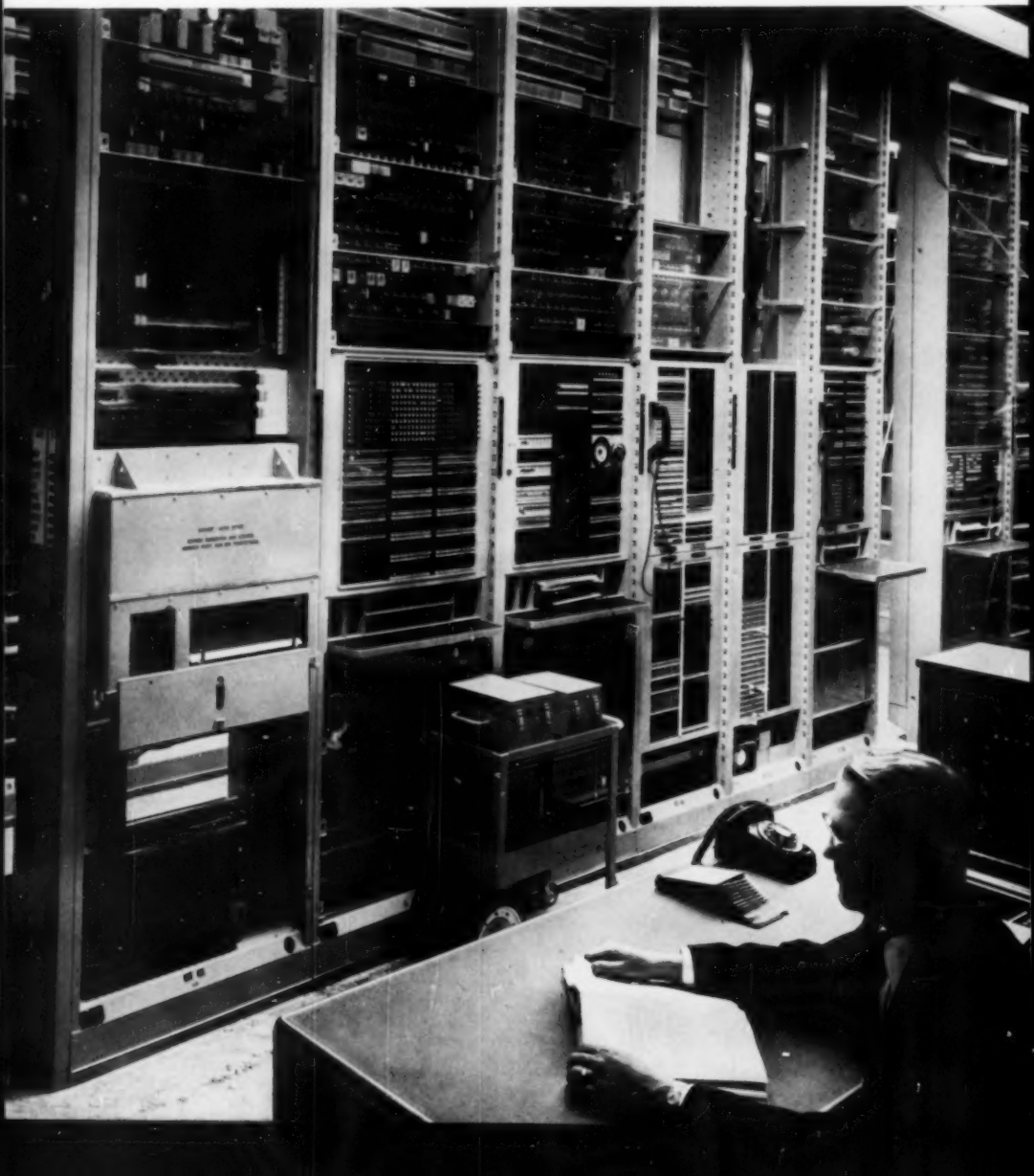
THE PICTURE at right indicates what the new "No. 5 Crossbar Package" will be like when the first of them have been manufactured and installed in the not too distant future. The size of the office is comparable; it contains substantially the same number of frames and kinds of equipment.

But there is this difference. The office pictured here, in common with other dial central offices now in service, is a custom job. In the past each office has had to be specially engineered — its components uniquely arranged to handle the specific service needs of the community it serves. Engineering, manufacturing and installing these custom jobs is time consuming, costly.

Consequently, a means of standardizing central offices has been long sought. But, until recently when a special task force consisting of W. Schiavoni and R. T. Burnett of A. T. & T., L. D. Ermish, D. F. Thomas and W. R. Heffernan of Western Electric and R. A. Chaney, J. W. Gorgas and J. E. Green of the Bell Laboratories attacked the problem full time, no satisfactory answer had been found. The first of the new "packages" they designed are already in manufacture with delivery scheduled for August. It is expected that substantial savings will result because of shortened engineering, manufacturing and installation intervals. For example, Operating Company orders for the packages can be marked on a single requisition form whereas telephone company engineers must submit lengthy specifications for similar custom jobs. All in all, the interval from ordering to actual operation has been cut from an average of about a year to seven months.

In the "No. 5 Crossbar Packaged Central Office" a combined A. T. & T., Western Electric and Bell Laboratories task force has found the answer to a System-wide problem.

New "packages" *will provide substantial savings over comparable custom built offices such as this.*



Thirty times as many Bell System people are injured off duty as during working hours. Ten times as many are killed. The single largest factor is the motor vehicle

What Can We Do About Off-Duty Accidents?

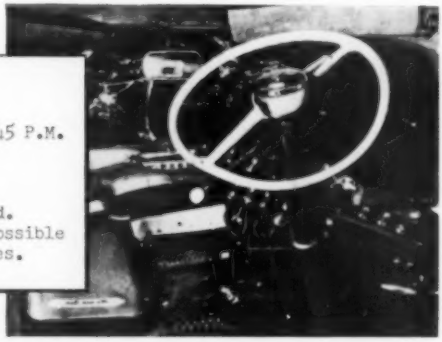
The entry on the police blotter read:

MV Accident Report

Junction of Main and Route 26, 10:45 P.M.

Car failed to negotiate turn.

Skid marks indicate excessive speed. Driver taken to Mercy Hospital. Possible skull fracture and internal injuries.



The circumstances in this report have been disguised somewhat, but you have heard of accidents just like this. They happen all the time.

The reason this typical case has been reported here is that this victim happened to be a telephone man. He was one of the 6000 Bell System people injured (62 of whom were killed) in off-duty motor vehicle accidents last year. The accident happened after hours—but the pain, the distress to the family, the time lost from work were the same as if the accident had happened on the job in mid-morning.

In our business we hear and think and do so much about on-the-job safety that sometimes we feel we are at the point of "safety fatigue." Nevertheless, our on-the-job safety record of .6 per million employee hours is outstanding. Assuredly, the continual campaigning throughout the Bell System to make people safety conscious has been the major factor in making this proud record possible.

The Off-Duty Record

But — the off-duty safety record of Bell System people is something else again. Out-of-hours fatalities are ten times as high. The off-duty injury total is 30 times as high! Here, obviously, is an area in which even more thinking and learning and listening and *doing* are essential.

As discussed in "Safety Around the Clock" in the Summer 1959 issue of this magazine, our off-duty accident rate has already come in for a great deal of attention in the Bell Companies. We are learning more about the frequency of such accidents, what caused them and how they can be prevented. We are sharing our knowledge with other industries.

For example, off-duty accidents was the subject of a talk given by John J. Hanselman, assistant vice president, Operations, A. T. & T., during President Eisenhower's Conference on Occupational Safety in Washington in early March. The new light that Mr. Hanselman was able to shed on the off-duty accident situation proved to be a revelation to the representatives of other industries who heard him. Our facts and figures, based on the accident rates of more than 600,000 Bell System people, presents a broad national sampling that is significant to other industries not in a position to gather such figures themselves.

"The Largest Factor"

The excerpts from Mr. Hanselman's talk which follow have to do with what he termed "the single largest factor in off-duty fatalities and injuries" — the motor vehicle. They merit the attention and serious consideration

Examples *of Bell System publications which deal with motor vehicle safety.*

of all Bell System management people — everywhere.

He explained to his audience that the Bell System has been obtaining information on off-duty fatalities for about 15 years and on off-duty injuries for the past two. An analysis of the data assembled has produced some very significant information, he said, including the fact that the motor vehicle accounts for 60 per cent of all off-duty fatalities (the same percentage as for on-duty fatalities). In two-thirds of the accidents our employee was the driver, in 32 per cent a passenger. Of the off-duty fatalities 53 per cent were male, although only 40 per cent of our total employees are male. A somewhat higher percentage of the female fatalities were passengers rather than drivers.

Motor vehicles are likewise a major factor in off-duty lost-time injuries — 27 per cent of the total. In some 51 per cent of these lost-time injuries our people were driving; in 47 per cent they were passengers and in two per cent, pedestrians. Over three-quarters of the total motor vehicle injuries involved women—usually as passengers.

Furthermore, the number of days lost per injury is 50 per cent higher where motor vehicles are involved than for all other types of off-duty lost-time injuries. In fact, 37 per cent of the off-duty days lost are due to motor vehicle accidents alone.

"The overwhelming evidence, I regret to say, from accident reports is that the vast majority of these accidents, both lost time and fatal, could have been avoided. This quite obviously puts much of the burden of prevention directly on us."

Training Helps

Another significant point that Mr. Hanselman brought out in his talk is a comparison of off-duty and on-the-job motor vehicle accidents for the same group of people. "While a precise comparison is not available from our data, an interesting broad comparison can be made." He explained to his audience that in our business most of the on-the-job motor vehicle

Cartoons *stressing motor vehicle safety rules have been reproduced from the National Safety Council Publication, "Five Minute Safety Talks for Driver Supervisors" by Hallie L. Myers.*

driving is done by Plant people.

Plant people are carefully trained and supervised in safe driving practices and this training seems to carry over to off-duty driving, as well, he stated. While Plant people comprise 39 per cent of the total, they have only 25 per cent of the off-duty motor vehicle accidents. Driver training was undoubtedly a major factor in this difference, he observed.

Mr. Hanselman made it plain to his listeners that experience has proved that off-duty accidents, as with on-the-job accident prevention, can be reduced through appropriate effort. Some companies, he said, have been stressing off-duty accident protection for many years. He cited the du Pont Company as a pioneer in this field, pointing out that it has reduced off-duty lost-time injuries by more than 25 per cent in five years. And he explained that Bell System off-duty fatalities have been decreased by more than ten per cent in each of the last four years.

"It seems clear . . ." he said "that if we are to attack the problem of off-duty fatalities and injuries one of the major areas to concentrate on is motor vehicles. This would include courses in driver training for all employees, joint craft-management reviews of motor vehicle accidents both off-duty and on-the-job, 'motor vehicle safety' and 'safety on the street' programs designed for school and civic club participation and other similar activities. Incidentally, a vitally important phase of driver training is instruction in 'defensive driving' — drivers are trained to see and recognize accident traps as they are developing and so avoid being caught in them."

Of course, we in the Bell System are already doing many of the things Mr. Hanselman suggested to the conferees. We are doing other things, too. Another panelist at the President's Conference on Occupational Safety was Marvin F. Oberg, also assistant vice president, Operations, A. T. & T., who talked on the subject of "safety communications" in the Bell System, describing the various publications,

Safe *driving programs are under way in several of the Bell Companies. The illustration above is taken from the New York Telephone Company's program for Traffic women.*

posters, visual aids, meetings and conferences, training, etc., which implement Bell System safety programs. Although his talk was concerned primarily with on-the-job safety, he also discussed media being used to promote off-duty safety. Examples of these are illustrated on these pages.

We are, unquestionably, making important strides toward the lowering of our off-duty accident rate. What more can and should we be doing? This is a question to which no one person can give the final, definitive answer. It *is* a question which should inspire each of us as individuals and as management people to take positive action.

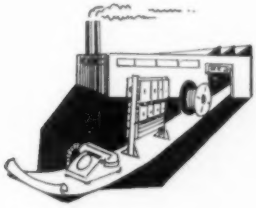
How Many is Too Many?

It is a well-known fact that alcohol is responsible for a large percentage (possibly as high as 50 per cent) of the national total of motor vehicle accidents each year. Not all of these accidents are caused by drivers who are visibly drunk, by any means. The person who stops off for a couple of drinks on the way home from work or who has two or three sociable drinks at a friend's house on Saturday night may be a hazard on the highway — without realizing it. There is increasing evidence that quite small amounts of alcohol can seriously impair driving ability. According to the Medical Guide for Physicians in Determining Fitness to Drive a Motor Vehicle, *a publication of the American Medical Association which is being made available to Bell Company medical staffs, "Numerous studies, using individuals accustomed to drinking, all are in full agreement that two 12-ounce bottles of 3.2% beer or two ounces of 100-proof whisky consumed within one hour will put the average moderate drinker in the zone of impaired driving ability . . ." The booklet goes on to say: "One drink may be tolerated. Two drinks put one in the level of impairment for about two hours. Three drinks are too many."*

Forecasting the huge amounts of equipment and supplies that the Bell Companies will need in the years ahead is the complex function of Western Electric's program planners. With the cooperation of all units of the Bell System they must continually answer the question—

How Much?—And When?

Robert M. Ferris, *Program Planning Manager*
WESTERN ELECTRIC COMPANY



How MANY MILLION telephones will the Bell Companies probably need this year, next year, five, even ten years from now? How many million lines of dial equipment or billions of conductor feet of cable? How much of dozens of other principal kinds of equipment and supplies should the Western Electric Company make or buy to supply the operating companies and, through them, to fulfill the needs and wants of Bell customers now and on into the future?

It is the function of the Western Electric Program Planning organization to help supply the best estimates possible to answer these questions—in fulfillment of W. E.'s Standard Supply Contract obligation to deliver "materials to the Telephone Company . . . in such quantities . . . and at such times as the Telephone Company may reasonably designate." The degree of accuracy with which this future demand can be predicted and planned for is directly related to the quality of service operating company people can give their customers and to the economy

and efficiency of their operations – and those of Western Electric, too.

A 'Combined Operation'

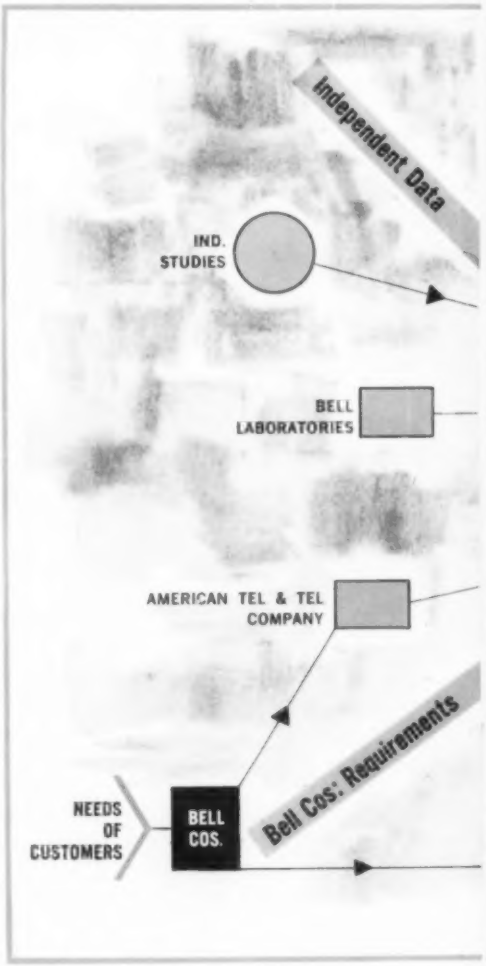
I hasten to add that we in program planning do not and could not handle this complex assignment alone. Forecasting a production program comprising the staggering amounts of materials needed to fulfill the Bell System's needs is properly and inevitably a joint operation – one in which all units of the System have a part. It is hoped that this article will help to bring about a better understanding throughout the System of some of the problems and hazards of program planning so that, together, we can improve the accuracy of our forecasts for everyone's benefit.

First of all, let's look at some fundamentals. In 1960 Western Electric's production facilities will be turning out nearly seven and a half million telephone sets, about three and a half million dial lines, over 140 billion conductor feet of cable and thousands of other related products. Record production levels will be set for many items.

Where Do We Begin?

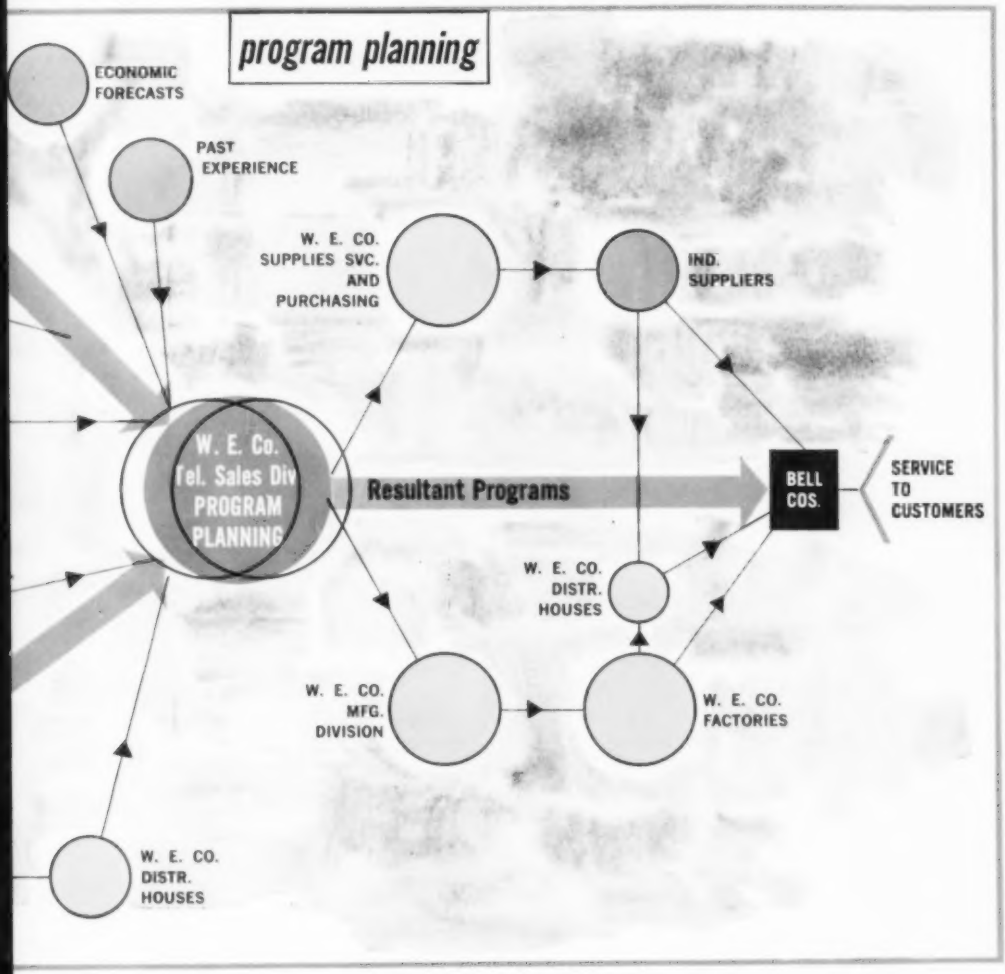
How did this 1960 program get started? How was the level of the production and shipment programs set? When were the plans for the 1960 program originated? How much can we expect this program to change between now and the end of the year? These and like questions fall into the realm of our activities. Actually, the plans for this year's production began with estimates made several years ago. Studies of all available information that would help us to increase the accuracy of our forecasts have continued ever since.

However, if we are to continue to help serve Bell customers effectively, we must know as much as possible about what products and services they will probably need not only this year but next year and as far into the future as possible. Moreover, our need to know is not confined to the items familiar today by any means. Research efforts, marketing plans, changing consumer habits and needs may call for



products not now in existence—entirely new services. On the basis of these future demands decisions must be made as to the number of people, the amount of raw materials, the space and machines that will be needed to meet them. New products or a growing demand for present ones may require Western to make a heavy investment in new plants. We must give our company enough time to meet future demands. Also the programs which we develop become the basis for estimates of results of W. E. operations, revisions of standard shop costs and a variety of other estimates. How well

Diagram *shows coordinated steps which help to "stack the cards in the customer's favor."*



Growing *number of households and increase in those with telephone service is important consideration in estimating telephone production.*

we do our job has an important impact on the Company's forward planning and the efficiency of its operations.

The Customers Are the Winners

The sort of planning we are talking about here is far from an exact science —and every industry is faced with the same problem. Some people say that such programming can't be made perfect; that it's a gamble to a great extent. The ultimate goal would be to have products roll out the front door of our manufacturing plants just as orders arrive at the back door, and it's true that we haven't reached this elusive Utopia. Nevertheless, from experience that extends over many years we know that we have been able to take some of the risk out of this so-called gamble. Actually, what we are attempting to do is to anticipate as accurately as possible

the needs of our Bell customers so that we can give them what they want when they want it.

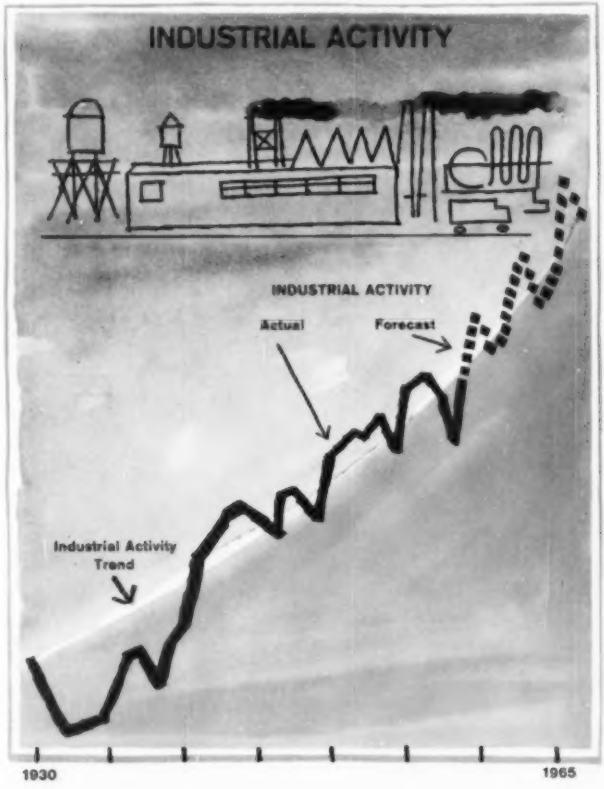
This is a complex operation; it takes literally hundreds of detailed and coordinated steps to transform estimated future needs into a proposed integrated program, and many other people and organizations of the Bell System are involved.

Construction Program Summary

The over-all operation begins with the operating companies. With the hindsight of past experience and a knowledge of current conditions of the demand for service, plant margins and operations performance, they try their best to peer into the future each quarter to make plans for the current and future years, often as many as five years ahead. When they reach conclusions on growth forecasts and their objectives, the Companies then determine their requirements for about 30 key classes of materials. These are incorporated in an over-all Construction Program Summary and forwarded to A. T. & T. At the same time Western's Distributing Houses obtain a more detailed breakdown of material requirements and send them to Program Planning.

Meanwhile, Program Planning has independently estimated new material requirements for about 70 program items by quarters for the current and ensuing year. Any divergent views of

Rate *of the nation's industrial activity (below) is another important barometer of the future demand for telephone service.*



the Companies, A. T. & T. and Western are reconciled to reflect the multiple judgment of all three organizations. But there is still more to be done. To the Bell shipments are added the estimated quantities for non-Bell requirements (mainly Graybar and Government) gathered from consultation with Western's Distributor Sales Organization and Radio Division.

Production and Shipment Program

Program Planning then proposes a production and shipment program to the Comptroller of Manufacture, who in turn furnishes an approved program to the Works locations. There they are expanded to cover all manufactured products and broken down into raw material and manpower requirements. Schedules are drawn up for the piece parts and assemblies that will go into the finished product and any anticipated roadblocks to meeting the programs are cleared through the lines of organization.

Simultaneously, W. E.'s Supplies Service Organization authorizes Purchasing to contract with suppliers for many important items Western will not manufacture. Production schedules and stock levels are also worked out.

The result of this coordination — the vast output of Western's factories and thousands of smaller independent businesses — will flow to the Operating Companies, either directly or through Western's 32 Distributing Houses, and ultimately to the telephone user.

Program Planning 'Tools'

From a look at this over-all process, it is obvious that a tremendous amount of foresight and planning has already been done by the Telephone Companies in the views they forward each quarter to Program Planning. But they are by no means the sole determining factor in establishing our programs. We compare and integrate them with our own views independently arrived at with the help of such tools as:

- The general economic outlook.
- Over-all trends of demand.
- Actual ordering rates.
- Telephone Company planned objectives.
- Future System-wide marketing and sales activities.
- New product design information from the Laboratories.
- Plus many other factors, depending on product.

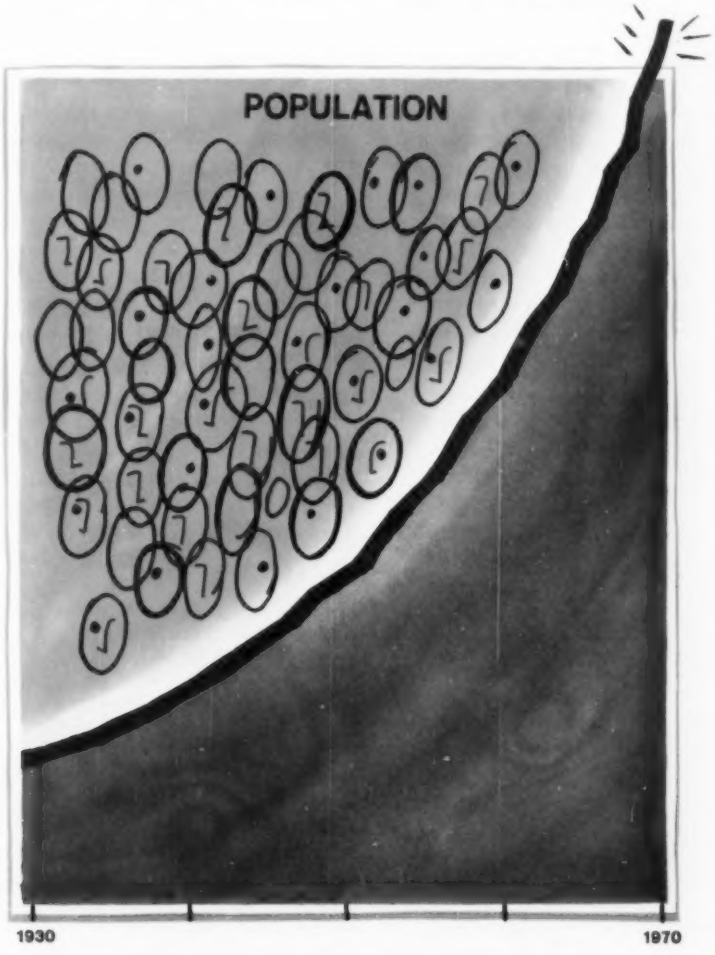
Telephone "growth," for example, contributes to our Bell sales program more than all other factors combined. Estimates of population and household increases, changes in consumer habits, assumptions as to general business conditions, and knowledge of the Companies' merchandising plans are some of the facets evaluated in forecasting growth. We also keep in close contact with the various plant merchandising organizations to learn actual ordering rates and anticipated changes in trend. Relationships and formulas developed over the years, continually up-dated to reflect changing conditions, are then added to this mix, along with the all-important ingredient of judgment.

Yet it is not enough to know the effect of population and household increases and expected business conditions on the basic growth items such as "main" telephone gain and long distance message increase. We must also know how many extensions will be added and the relationship of one, two and four-party lines. We must evaluate growth not only in terms of telephone instruments, but in terms of the cable, central office and carrier equipment that will be required to provide service.

Modernization

Although growth is the largest single factor affecting the size of Western's program, requirements for modernization or plant betterment also play a large part. Included are such items as local and long distance mechanization. Although 1959 saw over 95% of the Bell System's telephones on a dial basis and, consequently, local mechanization becoming a gradually diminishing factor, an increasing long distance program to expand and complete both operator dialing and customer DDD was balancing it off. The expected increase in the replacement rate of older or obsolete dial equipment also earmarks continuing quantities of materials for modernization purposes.

Population *increase is another factor that must be considered in planning for production. The present trend indicates a heavy future demand.*



By keeping close tabs on these and many other plans and projects through contacts with A. T. & T. and the Bell Laboratories, Program Planning is in a better position to judge their effect on the over-all program. Here, too, the program planner must rely on a variety of independent sources of data such as general business conditions and expected earnings which can influence the Telephone Companies' modernization plans.

The telephone user also gets into the act as a source of valuable data. To meet growing competition, we must continually gauge his attitude toward the style, color, design and utility of our products. We call this yardstick "preview planning" and accomplish it through the model shop concept.

This is a method for quickly producing models for limited field trials before the final stages of development. The guiding hand for this operation is a model shop committee of A. T. & T., Western and Bell Laboratories management people. Data made available on customer acceptance and technical performance influence many of the decisions and plans made by Program Planning for regular production of these new products. The Princess, born from the model shop concept, by 1961 will probably represent over 40 per cent of total telephone set production.

This, then, is the story of how Program Planning endeavors to answer the questions: how much? — and when? As you can see, our substitute for the omniscience that earned Nostradamus his reputation — is simply all of the economic facts and figures that can be accumulated, a knowledge of past telephone history, the interpretations of the experts, and our own judgment; review, condense and thrash it all out in conference, then hold your head. Until an infallible crystal ball is developed at the Laboratories, this exhaustive technique will remain the basis of our production and shipment programs.

INDEX NOW AVAILABLE

AN INDEX to Volume XXXVIII (1959) of the BELL TELEPHONE MAGAZINE may be obtained without charge upon request to the Public Relations Department of the American Telephone and Telegraph Company, 195 Broadway, New York 7, N. Y.

The MAGAZINE is also reproduced on microfilm: one volume to a single roll of positive film, suitably labeled. Inquiries concerning microfilms of the MAGAZINE should be addressed to University Microfilms, 313 N. First Street, Ann Arbor, Mich.

Who's Who & What's What In This Issue

AS VICE PRESIDENT in charge of Long Lines and also president of the Telephone Pioneers of America, Henry T. Killingsworth has a particularly busy and many-faceted life these days. It was, of course, in the latter capacity that he wrote "A Tradition in the Making" the interesting and informative article about the Pioneers which begins on page 2 of this issue. Mr. Killingsworth joined the Bell System as a Long Lines technical employee after graduation from Alabama Polytechnic Institute in 1919. During World War I he served in the U. S. Army as a Second Lieutenant. In 1925 he transferred to Long Lines Headquarters New York as an engineer and three years later went to Cleveland as division plant engineer. Following a series of assignments in different parts of the country he became Long Lines general manager in 1948 and in November, 1949 was elected to his present position. Mr. Killingsworth is associated with many business and social organizations.

ENTHUSIASM is not only an essential component of marketing and selling, but it is also contagious. Certainly, no one reading "Marketing Programs Pay Off!" which begins on page 16 of this issue could help but share the feeling of excitement of its authors for our new products such as The Princess and for the effective new programs being devised to merchandise them effectively. Roy E. Alberts, one of the co-authors, brings a background of sales, rates, personnel and business office experience to his present assignment as product marketing supervisor. His first Bell System jobs were with the Wisconsin Company. He was district commercial manager when he came to the A. T. & T. Commercial Division as an engineer in May 1957. He became market and product testing engineer the next year and entered the Marketing Department in 1958 and began his present assignment in July 1959.

CO-AUTHOR with Roy E. Alberts of "Marketing Programs Pay Off," Dan E. Hutchins, who is now a marketing representative, was able to call upon his considerable experience as editor with Ohio Bell in helping to prepare this article. Mr. Hutchins started his Bell

Henry T. Killingsworth

Dan E. Hutchins **Roy E. Alberts**

Estill I. Green

Robert M. Ferris

System career with that company as traffic assistant in 1951, becoming assistant district traffic superintendent in 1953. He joined the Ohio Bell Public Relations Department in 1955 and subsequently became editor of several publications including the *Ohio Bell* employee magazine and the customer magazine *Ohio Bell Voice*. He was information manager-employee information in the Ohio Company when he left to join A. T. & T. in 1958. He worked on the first coordinated marketing program — that for The Call Director, and has been associated with The Princess marketing program since its beginning.

ESTILL I. GREEN executive vice president of Bell Telephone Laboratories, has a long record of distinguished engineering experience and achievement, including more than 70 patents for his inventions. He is also the author of many articles on scientific and personnel subjects. He began his telephone career in 1921 with the American Telephone and Telegraph Company's development and research department, and with that department transferred to Bell Laboratories in 1934. For many years he specialized in planning the development of new transmission systems, and services and facilities for special customers. During World War II he was engaged in development work on radar testing apparatus and other electronic equipment. Mr. Green was appointed Director of Transmission Apparatus Development in 1948 and headed the development of systems components, including electronic components for transistorized systems. In 1953 he was named Director of Military Communications Systems, in charge of planning and development in that area. He became Vice President in charge of Systems Engineering in June 1955 and since that time has been responsible for all Bell Laboratories work related to the systematic analysis and planning of future communications developments and systems. He assumed his present post in 1959.

ROBERT M. FERRIS, Western Electric program planning manager whose article "How Much—And When?" appears on page 43 of this issue, has been engaged in the fascinating and complex occupation of helping to gauge the Bell System's future needs since October 1957. He began his Bell System career as a repairman with the New York Telephone Company in 1931. He was an engineer in the General Plant Supervisor's Office when he accepted the position of contract service specialist in Western Electric's Radio Division. After a series of assignments having to do with radio and radar for the Armed Forces, Mr. Ferris attended the Western Electric Management Training Program. Later he transferred to the W. E. Indianapolis Works where, in 1955 he became works comptroller. Two years later he returned to New York to undertake his present assignment.

In The News

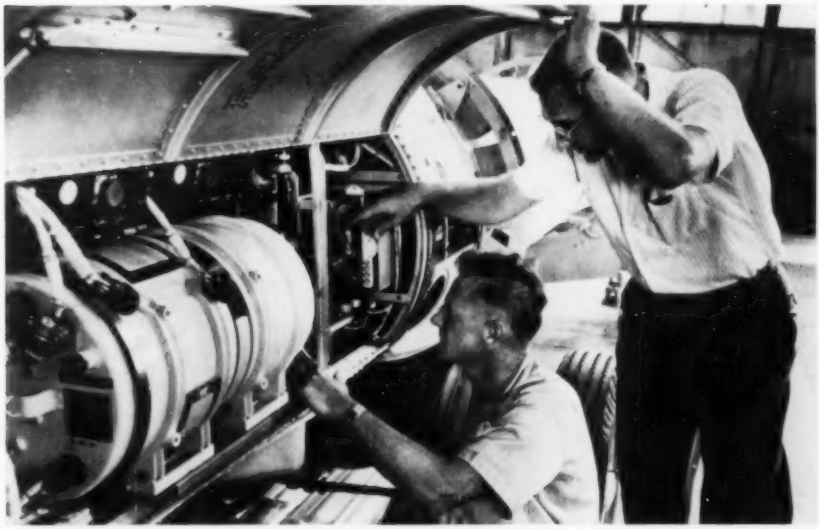
- *BTL and TIROS 1*
- *Home Interphone*
- *Voice Signal via Space Balloon*
- *Message Recording Service*
- *MV Accidents*
- *Commemorative Medallion*
- *Extension of DDD*
- *Arctic Undersea Cable*

The Tiros 1 meteorological satellite, the nation's newest space vehicle, was directed into its 400-mile circular orbit with the Bell Telephone Laboratories Command Guidance System. This radio-inertial command guidance is the same system developed by Bell Telephone Laboratories and Western Electric Company for the Air Force Ballistic Missile Division for use in the first squadrons of the Titan intercontinental ballistic missile. It was also used last year to guide the successful Thor Able re-entry test vehicles. Included in these tests were the first nose cone recoveries after flights of ICBM range.

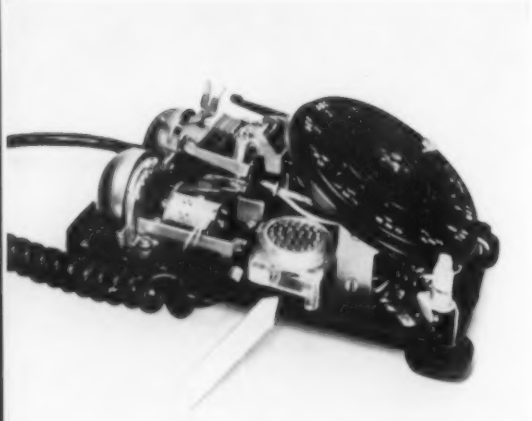
Capable of achieving what Bell Laboratories engineers describe as "pinpoint accuracy," the guidance system is well suited for space experiments, such as Tiros, where very precise control is required to obtain the desired orbit.

Home Interphone units are now being made by Western Electric. The step-saving new development, which wraps intra-residence voice communications and regular telephone service into one neat package, is to be market-tested in Georgia, Colorado, south central Pennsylvania and Illinois outside Chicago, and is scheduled for use throughout the Bell System later this year.

In addition to providing regular telephone service, the Home Interphone permits telephone conversation between



BTL engineers and second stage of Thor Able.



Undercover mike in this specially adapted phone makes the Home Interphone hands free.

rooms in the home and between a person inside the house and some one ringing the outside doorbell. Hands-free listening and answering are provided for those called over the home circuit.

A radio signal carrying a voice message was successfully transmitted recently via balloon from Holmdel, N. J., to the M.I.T. Lincoln Laboratory at Round Hill, Mass. The signal was reflected from a 100-foot, aluminum-coated balloon in space. The message, transmitted by radio researchers at Bell Laboratories, was the second station-to-station radio signal to be reflected from a man-made mirror in space. No voice message was transmitted in the first test, however.

This spring, the National Aeronautics and Space Administration (NASA) plans to send a similar sphere into orbit around the earth. The balloon will serve as a reflector for radio signals transmitted between Holmdel and the Jet Propulsion Laboratory at Goldstone, California.

Trends in the building industry toward recessing appliances and concealing home service facilities have made our customers more conscious of exposed telephone wiring. There are several trials and studies under way with the operating companies and it looks as if advance (concealed) wiring with sufficient outlets to provide for future as well as present service, is worthwhile because: It provides for substantial savings in future moves, changes and re-establishment of service; it aids extension sales; it makes new services much easier to sell and less expensive to install.

One important phase of the trials is a promising new method of pre-wiring presented by the Michigan Company.

Included also is a new sheathless cable being made available by Western Electric. This cable contains six pairs and is furnished on a disposable reel in lengths of 1,000 feet. The design of the reel and container makes it possible to uncoil and feed the cable easily.

The Bell System fleet experienced 8,959 motor vehicle accidents during 1959. This is the lowest figure since reporting started in 1956. *But*, the number of people killed in these accidents stands at 17 (seven were employees)—the highest on record.

Collisions at intersections are our biggest problem. These accounted for almost 40% of all accidents reported.

Detailed analysis of these accidents is included in the recently published *Motor Vehicle Accident Summary—Year 1959*. In sending this summary to the Companies it was suggested that if our drivers are made aware of the circumstances under which accidents most frequently occur they should be able to avoid becoming involved in similar situations.

A market trial of Incoming Message Recording Service, which has started in Boston, is being conducted in conjunction with four manufacturers of dictation recording equipment.

This service differs from automatic telephone answering and recording service now offered by the Companies in that

the voice announcement (given to the calling party prior to recording his message) is omitted and the customer provides the voice recorder which records the incoming message.

The equipment provided by the telephone company consists of a central office line (telephone number unlisted), a 500-type telephone set and a special recorder-control unit. The recorder is a commercial dictation machine.

It is contemplated that this service would be used by a "contained" group of people such as the salesmen of a firm who would be given the unlisted number to call and record their sales reports, etc. The advantages of such a record system are: Reports can be recorded on an unattended basis; customer can use his own dictation recorder and its recording can be routed through his stenographic room without special handling; customer can store recording for future reference.

It is planned to make about 90 installations of the equipment. The trial is expected to last about three months.

A commemorative medallion was awarded by the White House recently to 17 Long Lines men and one from the C. & P. Company of Virginia for their excellent handling of a rush communications job connected with President Eisenhower's tour of South America. The medallions were presented to the men at Long Lines Headquarters by Lt. Colonel George J. McNally, Commanding Officer of the White House Army Signal Agency.

The communications job, undertaken by Long Lines at the request of the United States and Brazilian governments, was to establish facilities to supplement the radio channels connecting Brasilia, the newly built capital of Brazil, with Rio de Janeiro. Less than two weeks after the telephone men and equipment had been flown to Brazil, the facilities were in top working order and ready for President Eisenhower's arrival.

The Long Lines men who received the award were: D. D. Donald, Radio Engineer, who supervised the operation; J. E. Heinrich, S. J. Balchan, C. S. Borthwick,

Presentation of medallion awarded by the White House.

D. W. Chamberlain, J. T. Neiswinter, H. W. Reichel, K. P. Stiles, J. R. Wenrich, A. D. Adams, D. J. Curran, L. K. Garland, E. H. Rice, Jr., J. J. Legler, J. D. Crain, M. W. Kettlehake and L. A. Peplin. The C. & P. man was W. E. Thomas.

Significant progress will be made in the extension of Direct Distance Dialing this year. More than seven million additional telephones will be equipped for ten-digit nationwide DDD, an increase of about 45 per cent over those equipped for this service at the end of 1959.

Among the largest cities that have already completed their program in 1960 are New York, Detroit and Montreal. By the end of the year, a large portion of customers in the Philadelphia metropolitan area will also have nationwide dialing.

Customers in Albuquerque and Harrisburg will be equipped for nationwide DDD service on April 24 using the newest type of facilities for this purpose—centralized automatic message accounting on No. 4A toll switching systems. Six other installations of this type are planned for later this year.

An antenna-amplifier combination that "hears" signals from outer space 30 times clearer than conventional microwave receivers has been developed by Bell Telephone Laboratories for experimental communication via satellites.

The antenna-amplifier combination could be extremely useful in investigating interplanetary radio signals of all kinds, regardless of origin.

The combination has a lower noise "temperature" than any complete receiving system ever demonstrated, and makes it possible to measure noise generated in the atmosphere with a precision never before obtained. Such a low-noise system could extend the range or increase the bandwidth of telemetering equipment used for rocket probes into space. The device also could extend the range of radio telescopes by a factor of ten in detecting hydrogen gas radiation emitted from far distant galaxies.

An important link in the rearward communications for America's Ballistic Missile Early Warning System (BMEWS) became a reality recently when the first undersea telephone cable above the Arctic Circle was completed. Owned by the United States Air Force, it connects Air Force installations in Greenland and Canada.

The Arctic undersea cable operation was carried out under the direction of the Western Electric Company with the cable placing being handled by the Long Lines Department of the American Telephone & Telephone Company. Western Electric is responsible to the United States Air Force for the design, installation and testing of rearward communications routes for BMEWS.

Four nations—Canada, Denmark, Great Britain and the United States—combined to make this first telephone cable beneath Arctic waters possible.

A recent letter to all Chief Engineers announces the availability of two packaged No. 5 Crossbar offices of 2360 and 2940 equipped lines. These package jobs are for manual conversions, dial with dial replacements and new wire centers, requiring features for end-office operation only (See page 36, this issue).

This announcement is the culmination of the first phase of the work of a Task Force of Laboratories, Western Electric and AT&T people organized last year. The results are very encouraging in that the Companies can now provide the attractive features of No. 5 common control operation in many more of the smaller sized offices. Further study is under way to explore the extension of this concept for toll offices and new units for existing step-by-step wire centers.

What is the Bell System?

THE Bell System is wires and cables and laboratories and manufacturing plants and local operating companies and millions of telephones in every part of the country.

The Bell System is people . . . hundreds of thousands of employees and more than a million and a half men and women who have invested their savings in the business.

It is more than that. **The Bell System is an idea.**

It is an idea that starts with the policy of providing you with the best possible telephone service at the lowest possible price.

But desire is not enough. Bright dreams and high hopes need to be brought to earth and made to work.

You could have all the equipment and still not have the service you know today.

You could have all the separate parts of the Bell System and not have the benefits of all those parts fitted together in a nationwide whole. It's the time-proved combination of research, manufacturing and operations in one organization—with close teamwork between all three—that results in good service, low cost, and constant improvements in the scope and usefulness of your telephone.

No matter whether it is one of the many tasks of everyday operation—or the special skills needed to invent the Transistor or develop underseas telephone cables—the Bell System has the will and the way to get it done.

And a spirit of courtesy and service that has come to be a most important part of the Bell System idea.

BELL TELEPHONE SYSTEM

American Telephone & Telegraph Company · Bell Telephone Laboratories · Western Electric Company · New England Telephone & Telegraph Company · Southern New England Telephone Company · New York Telephone Company · New Jersey Bell Telephone Company · The Bell Telephone Company of Pennsylvania · Diamond State Telephone Company · The Chesapeake & Potomac Telephone Companies · Southern Bell Telephone & Telegraph Company · The Ohio Bell Telephone Company · Cincinnati & Suburban Telephone Company · Michigan Bell Telephone Company · Indiana Bell Telephone Company · Wisconsin Telephone Company · Illinois Bell Telephone Company · Northwestern Bell Telephone Company · Southwestern Bell Telephone Company · The Mountain States Telephone & Telegraph Company · The Pacific Telephone & Telegraph Company · Pacific Telephone-Northwest · Bell Telephone Company of Nevada

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